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INSTITUTES OF SURGERY.

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INSTITUTES

OF

SURGERY:

ARRANGED IN THE ORDER OF THE LECTURES
DELIVERED IN THE UNIVERSITY
OF EDINBURGH.

BY

SIR CHARLES BELL, K. G. H.
F. R. SS. L. & E.
PROFESSOR OF SURGERY IN THE UNIVERSITY OF EDINBURGH;
LATE PROFESSOR OF ANATOMY AND SURGERY TO THE COLLEGE OF SURGEONS
OF LONDON; AND SURGEON OF THE MIDDLESEX HOSPITAL;
CONSULTING SURGEON OF THE ROYAL INFIRMARY OF EDINBURGH,
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IN TWO VOLUMES.

VOL. I.

ADAM & CHARLES BLACK, EDINBURGH;
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PREFACE AND DEDICATION.

THE study of Surgery, an art unexampled in the weight of responsibility which it imposes, must be prosecuted in more than one way,—at lectures, by attendance on the hospital, and by reading. There must be a book of ready reference. That book to be useful must recall to the reader's recollection the demonstrations and the reasonings which he has heard at lecture; for no book can be written which is sufficient for the practice of the profession: And it should state correctly, however shortly, the rules which are to guide the judgment and the hand of the practitioner, in the moment in which he is called upon to the performance of his high duties.

The book should also contain references to some of the best Authors, with a recommendation of those which ought to be read. But it is, above all, important

that such a work should contain so much of criticism at least, as may guard the reader against the bad influence of writers who have not known the hazards and difficulties of practice; who make unhesitating and bold assertions, where good and experienced men hesitate and are afraid; who write rather to obtain a name (an object not altogether to be condemned), than to guard their successors against the errors which they have witnessed, or to detail the means by which they themselves have happily succeeded.

I may allow myself to hope that the teachers under whom I have studied, the large and intimate intercourse which I have enjoyed with the best surgeons of my time, and the practice of a great Hospital for upwards of twenty years, will save me from the imputation of presumption in attempting that which, in one sense, must ever be an unprofitable labour. But my situation imposes it upon me as a duty; while my long superintendence of the juniors as house-surgeons and dressers, and the examinations of those about to commence the serious duties of their profession, have proved to me the necessity of such a work.

Knowing the opinions that prevail, I have sometimes entered into discussion in order to enforce the true principle: But the greater part of the contents of this volume, I wish rather to be considered as the conclusions drawn from the prelections, than as intended to present the whole argument, or to cite all the authorities on which the practice rests.

With sincere good wishes for my young friends, and fully aware of the difficulties and anxieties which they are about to encounter, I dedicate these volumes, and the remainder of my active life, to the Students of the University of Edinburgh.

AINSLIE PLACE,
20th October 1837

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INTRODUCTORY CHAPTER.

COURSE OF STUDY.

THOSE who have most improved the art of Surgery have passed at once from the school to the dissecting room. The notion which prevailed with medical men in London was, that we should acquire distinct notions of things from the dead subject, and not from books. Often we have heard it said, "Mr Hunter never read, why should I?" Thus were persons of very moderate abilities regulating themselves by a man of uncommon genius. When an opinion prevails extensively (as this did for thirty years after Mr Hunter's death), there is always a foundation for it; and the truth is, that the labours of the dissecting-room are the most essential to the surgeon. But something more is required for the accomplished surgeon. He is no longer a mere artist, a worker with his hands alone. The common sense of mankind has thrown into his department the treatment of many diseases, which require all the advantages of education hitherto imparted to the physician. The studies of the physician and of the surgeon have be-

come the same. Ancient languages are at least necessary to a correct nomenclature; and modern languages, to open new sources of information. The surgeon's medical studies must be liberally pursued; and a knowledge of Natural Philosophy must precede and accompany his professional acquirements.

Commencing under an anatomical teacher (who should know the true uses of anatomy), and having a general idea of the system of animal bodies, the student of surgery should undertake dissection early. This he must do to acquire an intimate knowledge of structure and a dexterous hand; and this is so necessary, that he should be in the anatomical rooms during the greater part of his attendance on the winter classes.

It is essential that he should practise some mechanical exercise, that he may acquire an accordance between the eye and the hand. My brother John Bell put me to drawing, modelling, and etching, with this view; but perhaps the best exercise of all is the art of anatomical preparation,—a very different matter from that exercise of the scalpel with which students are generally satisfied. Besides, it is this art of anatomy which conveys the knowledge not only of structure but of pathology; for the hasty examinations of the physicians in the dead-house are comparatively of little value.

The objects which should occupy the young surgeon in the dissecting-room are these: Every thing

done should have reference to the living body—the forces which act on the bones and ligaments—the classification of the muscles, and their action in cases of fracture and dislocation. Next to the ligaments in importance are the fasciæ. Then the dissector, to be usefully employed, must observe the exact relation of parts—the course of arteries—their bearings with regard to the points of bone and to the course of muscles and of their tendons—their sheaths, and the fasciæ which cover them: In short the parts to be recognized in cutting for them in the living body. He should make particular dissections, repeatedly and with great care. For example, the parts concerned in hernia—the anatomy of the perineum and the parts cut in lithotomy—the anatomy of the neck—and of the axilla, deserve particular dissection; and in this he does not dissect arteries and nerves as the distinct object of his studies, but he should look upon the system combinedly, and on each part in relation to the others.

Repeated courses of dissection pursued with these objects make a dexterous surgeon. But unfortunately they do more; they produce an itching desire to be operating and performing great operations,—a disposition which should be jealously watched, and which it requires years of self-examination and of experience to moderate.

This moderation ought to be acquired in the hospital. The student sees there great operations dex-

terously performed amidst the applause of hundreds: But it would be well for him to study the consequences of these exhibitions;—to follow the patient into the ward, there to learn the difference between dissecting and operating;—to see how much the human constitution can bear, and be directed to the study of the powers of life and of the constitution.*

When you come to be an operator, you would do well to catechise yourself:—Does the operation bid fair to give relief? Is it to be of advantage, as promoting the improvement of the profession? Has *self* any thing to do in the matter—vanity of display, or personal distinction and consequent emolument?

Clinical instruction is the last and best stage of this laborious course of study; and to maintain his spirits and perseverance during it, the student must look to the noble consequences, the power which knowledge places in his hands. Happily clinical instruction, as it was commenced in our University, so

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* Men's opinions being unsettled, go into extremes; they vibrate like the pendulum. The author has lived long enough to have witnessed changes in the character of the profession, and in his native city. The time was when the surgeon studied with no other view than the physician; and the operations of surgery were performed according to a rule which directed the instrument as in a handicraft business. Mr John Bell powerfully ridiculed this state of the profession, and spoke eloquently of the advantages of anatomy. Matters are now reversed, if not improved, and Edinburgh surgeons are noted for desperate operations and great dexterity. It must be our study to strike the mean between two extremes.

has it continued to be taught with great ability and diligence.

The student of surgery should take his Cases with the utmost care; for those early impressions furnish him with points round which all his future acquisitions are necessarily arranged. To these he will return often. These in after life are the true testimonials of diligence and merit.

There is nothing more important to the formation of a surgeon than a well selected library; books to which he may refer to keep up in him a spirit of inquiry and improvement. In noticing here a few authorities, I have preferred English authors, principally because they stand distinguished by truth of narration. From these you may select and form a portable library, which having studied diligently, you become capable of judging what additions your circumstances permit you to make.

Peruse in the library the published lectures of Sir Astley Cooper, and those of Mr Lawrence and Sir Benjamin Brodie. There is a spirit in the first which all who love their profession desire to see universal; reading and judgment appear in every sentence of the second: and experience and conduct in the last.

John Pearson's *Principles of Surgery* is a very good introduction—a safe book for a student. He was a learned and a successful practitioner. To beget in the student a respect and a love for his profession,

let him read Mr John Bell's works, especially his octavo volume on wounds. His larger work will relieve the tedium of professional reading.

Sixty-five years ago, the studies of the surgeon were principally of the French authors, Dionis, Le Dran, Morand, Petit, Sabatier.* Translations, such as that of Heister or Le Dran, were in their hands. Sagacious men had improved their practice beyond the precepts of these authors; but the duty to the profession at large was not thought of: we had few writers.

When men found it to be a duty to promulgate their opinions and practice, the genius of the country for sound philosophy and practical good sense soon manifested itself. Sharp, a surgeon of Guy's Hospital, was the commentator on the French writers. His book is entitled, A Critical Inquiry into the State of Surgery. With it you commence the study of English works, not taking it as an authority, but historically. You set out from it to mark the rapid improvement of surgical knowledge in this country, by Warner, Pott, and Cheselden. This brings you to John Hunter, a man of a different stamp from all who had gone before. In his hands anatomy became truly the foundation of our profession, allying it with science.

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* In the Memoirs of the Academy of Surgery of Paris, noble work, worthy of that country.

Instead of some coarse dissections made in an hospital, John Hunter, under the liberal tuition of his brother Dr William Hunter, studied minute structure; not in man alone, but in all classes of animals; and not for the vain objects of natural history, but to obtain a knowledge of life,—of the functions of the living animal body,—and all ultimately as a foundation of pathology for the relief of mankind. If you desire the history of Mr Hunter's labours, or look for his eulogy, go into the museum of the College of Surgeons of London, and there, as in St Paul's is said of Sir Christopher Wren—"Si monumentum requiris, circumspice."—There you will perceive by what extraordinary exertions of genius, ever active and enterprising, that one man has laid a new foundation for the profession, and taught by what means it is to be further pursued.

To Mr Hunter succeeded Mr Cline, Mr Abernethy, Sir Astley Cooper, Mr John Pearson, his pupils; all of whom, with the exception of Cline, have left works worthy of perusal.

To Cline, however, surgery is greatly indebted. During my thirty years' sojourn in London, his authority was paramount. His industry, moderation, and excellent sense, joined to great experience, made him the chief authority in practice for many a day. And although he has unfortunately left nothing by which posterity can judge of him, his opinion settled many questions of practice.

You will find quoted in the succeeding pages my colleagues Sir George Ballingall on Military Surgery; Professor Syme on Excision of the Joints; and Dr Thomson on Inflammation; Sir Astley Cooper on Hernia, and on the diseases of the Breast and of the Testes; Mr Hodgson on Aneurism; Mr Lawrence on Ruptures; Sir B. Brodie on the Joints; Mr Travers on Injuries of the Intestines; Ford on the Hip Joint; Home on the Prostate Gland.*

The best essays in English surgery are contained in the transactions of societies. Of these the Medical Essays of Edinburgh, the Medical Observations and Enquiries, and the Transactions of the Medico-Chirurgical Society, are the most distinguished for the narrative of important cases, and for a spirit of enquiry and improvement.

But I am exceeding all bounds. These, however, or a portion of them, will enrich my reader's mind and mature his judgment. After such a course of study he will stand in no need of a monitor.

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* A good-natured friend has added, "The Nervous System by Sir Charles Bell;" and if I must speak freely, I think it necessary to the study of symptoms in all the departments of practice.

DIVISION I.

THE GENERAL PRINCIPLES AND EXTERNAL INJURIES.

INSTITUTES

OF

SURGERY.

CHAPTER I.

OF HEALTH AND THE CONSTITUTION.*

UNDER this title a bulky volume may be written. There are some deductions from the introductory lectures which may be noted, and ought to be ever kept before the surgeon; questions which he must put to himself, when a patient is laid down to be confined in consequence of some severe accident; or when he is about to perform an operation attended with division of integument.

There is an influence bearing on the constitution, before there are visible signs of disease.

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* Read Mr Abernethy *On the constitutional origin of local diseases*, and Travers *On constitutional irritation*. Some valuable observations in Mr Hunter *On the blood;* Sir George Ballingall's introductory chapters.

Most men are in a condition removed from that of perfect health.

Hence the mistakes in believing it possible to do operations on the human body, which succeed as experiments on brutes.

The mind, too, has influence. A man having been bitten by a mad dog, ran into the hospital. I cut out the piece; in two days his arm mortified to the shoulder.

It is necessary to study the slightest sign of this condition. Thus it is, that a man walks about and visits his friends, having no disease visible to the unexperienced eye; but when an operation is performed, then the prevailing disposition of the system shews itself.

Therefore we ask—Is there flatulence and loss of appetite? Fetor of the breath? Unnatural colour and smell of stools? The tongue—is it whitish, dry, furred? Is there tenderness of the epigastrium? Is the urine turbid—the eye suffused—and the complexion dull?

If an operation be performed with a state of system removed from that of health; then there is irritability of stomach: The lips of the wound do not swell and inflame as they ought to do, were they divided in a healthy body: The lips remain flaccid and apart; a gleety discharge is poured out; the fascia is bare and sloughy; the patient refuses food; the countenance is that of misery, and he sinks.

When in such a condition a tumour has been extirpated; the consequence of a trifling wound has been erysipelas, mortification, and death!

Too much attention cannot be paid to the state of the stomach; yet, theoretically, there is an error which leads to the neglect of important circumstances.

Mr Abernethy's views were too much confined by his practice in the East of London, and the hospital. Those peculiarities of constitution which defeat the best planned operations of the surgeon, do not altogether and at all times owe their origin to the stomach. If a man must limit himself to one remedy, *his* was the best. There is an influence before the stomach becomes deranged; and, acting on the great aphorism, *to remove the cause*, we must think of these influences. Let the reader peruse the history of campaigns in foreign climates, and he will be made aware of them.

Thus, confinement, bad ventilation, depression of mind, precede and occasion the recognisable symptoms of disordered functions.

There are many things which escape our observation in the individual which are obvious in the mass. *e. g.* Aboard a ship, after a severely contested battle, the men who have suffered amputation will exhibit different conditions in the healing process of the stump, according as they are laid low and remote from the port-hole, or near it and raised from the deck. This adheres; that suppurates; a third is fetid and sloughy, preceded by fever,—according to the freedom of ventilation. (Conversation with Dr Dickson.)

The surgeon should make himself acquainted with the subject of ventilation; he should be aware of the fatal effects of the want of ventilation in great hospitals. The horses in transports become in a short time subject to inflammation of the lungs, or of the eyes, or to glanders; and the beasts in a menagerie have diseases engendered. Read Sir George Ballingall's chapter on Hospital Gangrene.

There is a condition of the intestinal canal, natural during health and activity, that becomes highly injurious after an accident, which confines the individual to absolute and long-continued confinement. Hence the universal practice of evacuating the bowels in the commencement of attendance.

Independently of the digestive assimilating processes, there is in the stomach and intestines a principle of vitality

in operation, which arrests all chemical change of the ingesta. But when the powers fall low, this influence being diminished, chemical decomposition takes place, and, following it, great distress. Hence the necessity of mild laxatives, which shall disburden the stomach and intestines without debilitating.

If this be not attended to, the patient becomes restless and anxious; which ushers in fever.

Yet it must be recollected, that simple purging is very different from *critical evacuation*. Thus, when a vital part has been injured, and the patient has become restless, and anxious, and feverish, relief is to be obtained only by the intestines becoming active, and discharging large fœtid stools.

In reading cases, how often do you find this occur,—that the most violent symptoms cease on copious evacuations of dark and fetid stools? This is not mere evacuation of the intestines, but *a purging into them* of secretions which had been locked up.

Pathologists do sometimes confound the effects of accumulation in the intestines with that torpor which confines the natural secretions; attributing extraordinary cures to the evacuation of the canal, which are more justly to be ascribed to the restoration of the biliary and other secretions.

Admitting, as we must, that irritation and disordered function of the intestinal canal produce very many local diseases of parts both external and internal, and also of the vascular and nervous systems, yet it is not mere remora or accumulation which is the cause; nor will the discharge of feculent matter be the cure. The cause is often a disturbed function of a portion of the alimentary canal: And this consideration opens another subject of study, the influence of particular purgatives and alteratives on

the mucous surface of the intestines. See *Neuralgic pain.*

Towards the termination of some surgical cases in death, there is an atony, a want of tone, of the hollow viscera, attended with flatulent distention, in which condition, if active purgatives be given, they destroy the patient.

For example, if cold saline purgatives be administered with the idea of procuring stools, instead of carminative and stomachic purgatives, and enemata of assafœtida, and medicines to give strength, the belly becomes more tympanitic, and the patient sinks.

When the constitution is influenced either by a wound or by local disease, "universal sympathy prevailing," distinct systems as well as different organs will become affected; *e. g.* 1. The sanguiferous system.[1] 2. The nervous system.[2] 3. The whole digestive apparatus.[3]

[1] Shewn by the action of the heart and arteries—the temperature increased—fever.

[2] Shewn by vigilance, delirium, or convulsions.

[3] By the symptoms above enumerated, p. 9.

Thus, a wound of the head, or an irritable ulcer, will produce symptoms not readily traced to their true cause.

See Erysipelas.

In all those cases there is a sudden influence of atmosphere, its temperature, moisture, pressure, and unknown qualities. The season of the year, the wind that prevails, the soil over which it blows, have an influence on the constitution, which must be studied by the surgeon who has to conduct a tedious

cure, when a wound has been received or an operation performed.

A surgeon at home is apt to forget these effects, but he cannot fail to notice them in the camp. He sees trifling wounds become formidable; sloughing sores, and slight injuries mortifying; not one but many suffering: Then he looks around and thinks of the prevailing disease,—what fever or dysentery is common? The remedies for these are the means of supporting his surgical patients; for although in them the disease be not recognisable by symptoms, yet the influence is upon them retarding recovery.

A case of tetanus may occur and leave us in the dark as to the cause; but if an army sit down to besiege a town, and every case of amputation, every case of wound, even to the bleeding with the lancet, terminate in tetanus, the cause cannot be mistaken.

Thus is the knowledge of medicine the introduction to surgery, and a liberal knowledge of the science necessary to the art.

The blue pill and the bitter draught are not the whole of medical practice necessary to surgery; nor the mere succession of purgatives the universal remedy. There are other conditions to be studied besides that of the London Alderman, or the porter-swilling drayman. This is more especially to be considered, if your duty call you abroad. In Europe, in the Mediterranean, in the East Indies, in America, and the West Indies, the *epidemic* is to be recognised in the retardation of the process of cure. This knowledge will be found in the works of Pringle and Blane, of Dr John Hunter (an ingenious man, but not Mr Hunter), of Dr Jackson Lind, &c.

You now comprehend how a slight operation proves fatal, and how sometimes a rash fool succeeds;

all depending on the unrevealed state of the constitution. What, then, are our duties to our patient, in order to insure success?

Before an operation is performed, you would do well to look to the eye, the countenance, the condition of the skin, the regularity of the evacuations, and the state of the secretions. If, by acquaintance with his constitution or condition, you have learned that a leech bite or a blister has been followed by erythema, you would do well to conquer this disposition of the system. The day preceding an operation you give a warm purgative.*

If the bowels be habitually loaded for some days, you order small and largely diluted doses of the sulphate of magnesia, with air and exercise.

If the secretions are deranged, undebilitating doses of the *Pil. Hydrarg.*; or of the *Pulv. Hydrarg. cum Creta.* With a morning draught of rhubarb and sulphate of potass.

Read Abernethy's *Local Diseases*, p. 92.

Read Dr Plummer's Essay in *Med. Essays of Edin.*

Again, there can be no division of cases. The business of the physician and of the surgeon is the same. There is no true division of diseases into *internal* or *external*; or into *general* or *local*:—Nor can you decide on the treatment of the disease of an *organ*, without considering whether it be primarily affected, or secondarily; that is, whether it result from a reflected influence from the state of constitution.

It will not be imagined that, after the life the author has led, he can desire to throw discredit on *morbid anatomy*; but, by poking in the dead-house, we shall not discover the

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* For example—

℞ Pulv. Rhei,
Magnes Carbon. . ā ℈i.
Tinct. Sennæ,
Tinct. Cardamom. Comp. ā ʒi.
Aquæ Menth. pip. . ℥x. ft. Haustus.

sources of disease. We are informed to what disorder of organs the disease tends, and the source of formidable symptoms, but not the cause from which these mischiefs spring.

In conclusion,—in all surgical complaints, and in all cases of operation, study that your patient breathe a pure atmosphere and enjoy tranquillity of mind; preserve the skin clean and perspirable, by medicine, tepid bathing, and the flesh-brush. Let the diet be varied, but simple; and the bowels active and regular, without irritation, and the dejections of a natural colour.

Prosecute this subject under the different heads; *e. g.* The treatment of Phlegmon—of Erysipelas—the conditions of the body when subject to ulcer, &c.

CHAPTER II.

INFLAMMATION,* AS CONSEQUENT ON WOUNDS AND OPERATIONS.

I shall not consider inflammation as a disease, for that would carry us at once into all the intricacies of the subject; but simply as that excited action which takes place in a healthy body when suffering from external injury.

This puts aside those reflected influences which constitute disease.

Inflammation attends all morbid changes, and if taken in its combinations, embraces the whole system of pathology. The simplest way in which we may approach the subject is by the question,—Does this excited vascular action tend to recovery and restoration? or does it participate in the morbid condition?

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* To treat fully of this subject would be to transcribe the lectures; to treat of the structure and action of arteries; the forces circulating the blood; the condition of the blood out of the body, and in it. So that under this head might be embraced the whole of surgical pathology and practice.

The reader will find an admirable introduction to practice in John Pearson's Principles of Surgery, and in the first hundred pages of Mr Abernethy's lectures.

After hearing lecture, he will peruse with advantage Dr Thomson on Inflammation and Mr Hunter's great work, which I place last, although it be the ground-work of all we know, and in which the art is founded on just principles, and brought into alliance with science.

Phlegmon is thus characterized. There is pain, heat, redness, swelling.[1] There is an increased quantity of blood in circulation, and increased activity of vessels.[2] This activity consists in an increased frequency of pulsation, an increased contraction and greater dilatation.

[1] Then it must be the combination of all these. We have exquisite pain without increase of vascular action, as in tic. We have morbid sensation of heat in the stomach, anus, urethra. We have burning sensation on the skin, without either inflammation or actual heat. We have redness in the flush of health, and in the natural excitement of a part. We have swelling from œdema, indicative of weakness and not of inflammation.

[2] The anatomist seeks an inflamed part, that he may succeed in a minute injection. The surgeon cutting into inflamed parts sees the blood flow with greater impetus. The microscope [when you take precautions against evaporation] exhibits an increased current of the globules.

The accompanying fever resembles the idiopathic inflammatory fever. It comes on with less distinct announcement. Perhaps the patient is chill, and vomits. The pulse is frequent, full, and strong. He is restless and vigilant. The secretions are diminished.

That is, the skin is hot and dry; the mouth parched, with thirst and loss of appetite; the urine is less copious, and high coloured.

The blood drawn coagulates slowly; the coagulum is firm, and has the buffy coat.

If there has been extreme violence, there is faintness, convulsions, or delirium.

If the system is recovering from the shock, the symptoms will abate about the third day, and the secretions will be re-established.

Taking this as a general statement, the patient's condition may be influenced by many circumstances; by age, constitution, and situation;[1] by the part injured or affected;[2] and the danger will be in proportion to the importance of the organ or the delicacy of its texture.[3]

[1] A country man with a fractured limb is in a more hopeful condition than a pale artizan laid in hospital.

[2] The relation of organs to the general system will produce an alteration of symptoms. The stomach being the seat, there will be oppression, dejection, and a pulse low and quick. The pulse, in inflammation of the intestines, will be small and quick. The heart and lungs will exhibit the contrary extreme. The symptoms will vary as the brain, the eye, the joints, the bone, are affected.

[3] Common sense dictates that, if inflammation be left to run to effusion or the deposite of coagulable lymph, when the brain or the eye is affected, permanent loss of function must result.

Every person has some peculiarity of constitution, which influences the general symptoms.

A strumous, syphilitic, or rheumatic action, may be excited by a blow, or by an operation. So the fever which is excited, as in idiopathic inflammatory fever, may assume a new character, as nervous, gastric, or dysenteric.

The universal sympathy brings some remote part into corresponding activity; and the supervening local affection mingles its influence with the original symptoms.

The common expression "the weak part" is not amiss; constitutionally weak. Thus, the operation of amputation may destroy the patient, by exciting inflammation of the lungs. Thus is the hand of the surgeon arrested in a case of fistula, when the patient has morning expectoration. But not the lungs only, other organs also, as the liver (especially in warm climates), the kidney, the bladder, and prostate, the mucous surfaces of the stomach and intestines, may be ex-

cited into disease from a prevailing inflammatory condition of the system, consequent on injury; or after a formidable operation.

See Quesney, tom. i.; Mem. of the Paris. Acad.; Desault on Wounds of the Head; Baron Larrey.

Obstructions, engorgements, and enlargement of viscera, may follow the symptomatic, as they do the idiopathic, fever.

The phlegmonous inflammation has its stages,—adhesive, suppurative, and ulcerative.

Inflammation (phlegmon) terminates in resolution; in adhesion; in suppuration and ulceration; in mortification. It may terminate in chronic inflammation; in hypertrophy; in atrophy.

Thus, it not unfrequently happens, that in inflammation of the testicle, instead of its simply subsiding with a diminution of tumour, the absorption proceeds to the wasting of the gland altogether.

We desire that it may terminate in resolution; in other words, that it may gradually subside; and to this condition we endeavour to bring it by the following means.

General Remedies.

On this subject a few remarks may be useful. In all severe accidents, after all serious operations, watch the first symptoms of an attack upon the lungs. You take the common precautions against raising inflammation, by avoiding solid food; by acidulated drink and effervescing draughts; by antimonials; by sponging in dryness of the skin, and feverish heat; and all the usual attentions to cleanliness, ventilation, and repose. When you use the lancet, take the firmness of the coagulum into your con-

sideration as much as the buffy coat. If the coagulum be flat and easily broken, have recourse to other remedies than bleeding. Learn to judge of the pulse, which is always to be taken in conjunction with the state of the blood.

Learn to distinguish the condition of the pulse,—as strong frequent, hard, quick, vibratory; and these, as contrasted with soft, compressible, slow. Attend also to the colour of the blood as it flows, red or florid, viscid and thick. The buffy coat attends local inflammations; the serum is limpid, and in small quantity.

The pulse will sometimes rise from bleeding, as in inflammation of the viscera.

It will throb so as to deceive you, when fatal consequences will attend further depletion. Be careful to avoid the mistake of taking irritation for inflammation. In general, inflammations attributable to morbid states of the system do not bear bleeding, as that inflammation does which follows a wound or surgical operation.

There is a *jar* indicative of irritation after the inflammatory strength has been subdued.

You bleed in the young and robust, in circumstances where you would avoid it in an older patient.

You consider the organ which is the seat of inflammation.

Thus you bleed freely in case of inflammation of heart or lungs, or brain or eye.

You are careful to take into account the nature of the accident; the tedious time required for recovery; remembering that, when the excitement is over, the powers of life fall low, and that you may have to regret that you reduced the strength so much.

Local bleeding is always safe.

Purgatives.—These succeed to bleeding as the means of relieving over action, viz. by watery stools.

Proceed through the neutral salts and their combinations, viz. the red mixture of the hospitals, the black draught, &c.; or you employ calomel, jalap, and James's powder.

What, then, is to be done when you dare evacuate no farther? Have recourse to antimonials; join them with the saline purgative, or with mercury.

You avoid full vomiting, unless in particular cases as in swelled testicle. Mr Pearson longed to have a cure for inflammation that would not debilitate; we have it in antimonials. They subdue the pulse and soften the skin, without permanently taking away power. *Mercury* is a powerful remedy in checking inflammation; it is used when we dread the deposit of coagulable lymph on delicate textures; *e. g.* the brain, the eye, the larynx. It joins well with opiates.

Opiates must be used only after evacuations, or when the strength is subdued by long suffering. They are best joined with relaxants, as ipecacuanha.

Local applications.—Do not use counter irritants in acute inflammation; reserve them for the chronic stage.

Use evaporating lotions.

Sometimes iced water, as in compound dislocations. Teach yourself how to use syphon threads, to secure a continual flow of cold water over the inflamed surface: Or you prescribe the lotion of *cerussa acetata*, or of the *muriate of ammonia*.

Avoid this, however, in all critical phlegmons; nor in that case use any repellant, nor attempt resolution. In all constitutional affections, prefer tepid anodyne applications to cold.

In *hernia humoralis* you would do well to prefer tepid ap-

plications. Cold is bad on the general principle, and causes a painful contraction of the cremaster muscle.

It will happen that you have inflammation rising from a severe accident, in a constitution exhausted by dissipation. Your patient does not sleep; he has a worn out appearance; he is fidgety; answers incoherently; rises from bed in the night; becomes violent. Then will these evacuants and refrigerating applications prove of no avail.

Then employ emetics and opium, and these failing, you may be forced to have recourse to stimulants, porter and gin! Here take up the subject of *delirium tremens* from your medical authorities.

As I have purposely limited the consideration of inflammation to the reaction after external injury, it is necessary to advert to the most distressing and formidable case; where there is prostration without reaction. Thus it happens; the patient is seized with bilious vomiting, becomes restless and agitated; sleepless; wanders and mutters; not the part injured, but a remote part, swells, and exhibits erythema; becomes gorged; mortifies and sloughs; and the patient sinks, without manifesting the symptoms of inflammation or of inflammatory fever.

Something similar to this condition will attend inflammation of the veins, as after amputation.

The subject continued under *Adhesion, Abscess, Wounds.*

CHAPTER III.

ADHESION.*

Of what are called the terminations of inflammation, we consider adhesion as a process of health, and embracing much of practical importance.

When there is a division of the integument or muscle, a process is set up which terminates in the reunion of the cut surfaces. When the wound reunites without suppuration, it is called *adhesion by the first intention.*

It is hardly a fair question to ask, How soon does adhesion take place? If we mean, when does that sympathy take place between the living surface, we may answer immediately. But the firm junction requires time; an inflamed intestine will be found adhering in seven hours; the lip in twenty-four hours; in amputation, the flap will be found adhering in three days.

To this process of adhesion, a certain degree of inflammatory action is necessary. It is seldom, however, that we have to promote the action; but on the contrary we have to moderate it.

The term used by Mr Hunter, *adhesive inflammation,* may mislead, as implying the necessity of an excited action to the

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* We must reserve for lecture what is called the history of adhesion; the experiments of Hunter and Du Hamel; the operation of Taliacotius; the operation of amputation, &c.—*See Mr John Bell's works.*

happy result of our operations. But the injury committed, the mere division of the part, is sufficient stimulus to the body in health. In the secondary process of adhesion, we may require to stimulate the system or the part.

The bloodvessels of the divided surfaces throw out blood; the hæmorrhage ceases, and serum flows; the serum gives place to coagulable lymph, which becomes the medium of union.

Mr Hunter has said the medium of union is blood. Do not let this opinion make you careless as to the coagulum remaining between cut surfaces; for it will disappoint you, and lead to suppuration, and not of a good kind. You are, therefore, in all wounds, and where you desire immediate adhesion, to clear away the blood; and in stabs and dirk wounds, the practice has obtained to suck out the blood. See the old practice in the armies of France, *J. Bell's Principles of Surgery.*

As soon as the surfaces have ceased bleeding, they are to be brought together for adhesion. If they are not so united, and the wound remains gaping, another process is begun; the coagulable lymph becomes organised, and through it pus is secreted, and by-and-by granulations arise. This marks the period for *secondary adhesion.*

Instead of indulging in the idea of "*procuring*" adhesion, see that you do nothing to retard or impede it. It is a natural process, which will complete itself. You have, however, a very obvious duty, to keep the parts together and at rest, and to preserve the health.

To guard against disease. Now it happens thus: the operation is performed—adhesion begun—but the patient is irritable, has a cold shivering, with increasing heat in the part—fever is established, and next day you find the lips open, and suppuration established.

When adhesion has taken place, the sympathetic fever subsides; the inflammation terminates.

Hence the beneficial effects of temporary and even partial adhesion, as in amputation; you surmount a period of peril from excess of action. See Penetrating Wound.

The means of procuring adhesion, therefore, are mechanical; to relax the muscles, which your anatomical studies enable you to do; to draw together and retain the surfaces in contact; and to enjoin perfect rest.

The means being the *adhesive strap*, the *dry suture*, the *uniting bandage*, the use of the needle (Sutura cruenta).

All that regards dressing should be studied in the hospital. But from the bad taste (to give it the mildest term) which prevails, and which tempts surgeons to contend against time, and therefore to have the patient soon off the table, the dressings are huddled on, or deferred. Surgeons of public institutions owe therefore a public duty,—to serve the poor, but also to be an example to their younger brethren, that right methods may be taught. The dressing of a patient after an operation is very often the most important part of the office of a surgeon, and any thing like hurry the most dangerous lesson. This observation I was tempted to make long ago, after being prevailed on by Mr Abernethy to neglect my brother's precept and example. Mr Abernethy assisted me in my operation. I object to what he has laid down, p. 200, sect. 10, Lectures.

The adhesive plaster should be so applied as to avoid retaining discharge; either a little apart, or snipped so as to open in the centre (fenêtre). The dry suture is a large piece of adhesive plaster, with eyelet-holes and ligature attached; the plaster being laid on the sides of the wound, and the threads tied across. Ligatures put through the integuments with the needle are to be avoided when possible; where there is proper resistance they are not necessary. They must be used in the cheek, eyelids, abdomen, &c. A ligature to unite a wound should have two needles; they should be passed from within outwards. The ligatures

should be supported in the interval by adhesive straps, so as to take off the strain of the swelling integuments. For the quilled suture see the *torn perineum*. For the application of the compress and double-headed roller, see Wounds. In dressing, one strap should be taken off, and another put to replace it, and so in succession: When all are loosened at once the new formed adhesions are torn up.

Study the subject under the head of *Harelip Operation*, *Ruptured Perineum*, *Amputation*, *&c.*

Preventing Adhesion. Procuring Adhesion.

It is very often the object of the surgeon to prevent adhesion, or to prevent the consolidation of the cellular membrane under inflammation, which is a species of adhesion.

As in phymosis and in imperforate vagina.

He has a difficult task who has to effect this in the case of burns.

The *cicatrix* (see Ulcers) is attended with a contraction and consolidation of the cellular membrane, by which its elasticity is destroyed. It is this compact or solid state of the integument which causes those distressing contractions after inflammation, and especially that action which is induced by burns. You will have to employ this property against the disposition; that is, you will have to induce cicatrization in one direction in order to oppose the tendency to it in another. See an ingenious paper by Mr Earle, Med. Chir. Transac. See operations on the eyelids, &c., also the operation of closing fistulous openings.

You have on many occasions to excite the process of secondary adhesion; as when the natural passages have been opened by sloughing or phagedæna; the trachea divided by the suicide; the perineum ruptured in labour; and urethra opened in fistula.

When by paring the edges, and the use of sutures, you fail, you may still succeed by inducing granulation.

You touch the edges with the caustic, dress with the cantharides ointment, and cover all with a poultice. Thus by hot, stimulating, and balsamic dressing, you bring the edges into the state of suppuration and granulation. Then peeling off the thin cuticle from the granulations, and making a bleeding surface, you once more employ all your mechanical means to keep the surfaces in contact. I have succeeded by a slower process; a more striking imitation of the process of adhesion after burns. Sometimes by the use of nitric acid; sometimes by laying a hot wire in different directions on the mouth of the opening, so as to induce a gradual process of condensation and contraction.

CHAPTER IV.

SUPPURATION AND ABSCESS.

Suppuration is another form of action in the animal body tending to restoration.* We have anticipated its condition in a cut or open wound.

The surface thus exposed throws out coagulable lymph; pus is secreted through that film, and being thus covered and protected by secretion, granulations are formed. These sprouting fill up the gap, and cicatrization completes the regeneration.

Deferring the subject of granulation (see Ulcers), some observations are called for on that of Pus.

Of the authorities on this subject, we are chiefly indebted to Dr William Hunter, who taught us that ulceration was not necessary to the formation of purulent matter, but that it may be secreted from mucous and serous surfaces.

How important to know that purulency in the sputa is not necessarily implying vomicæ; that the matter of gonorrhœa does not imply ulceration in the urethra! The great merit of Mr John Hunter has obscured the less brilliant but not the less useful labours of the elder brother.

Remember—that to be ignorant of the merits of these two men, is to be negligent of the honour of the profession, and ungrateful for the benefits you have received.

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* Acknowledging our obligations to *Dr Senac, Dr Simpson, Dr William Hunter, De Haen, Dr Morgan, Mr Hunter, Sir Everard Home,* and *Darwin,* on this subject, we may *here* limit our observations to what is strictly practical.

On a mucous surface, we perceive the change soon after inflammation has taken place; the secretion is no longer cohesive, tough, or viscid; no longer difficult to mix with water; from transparent it becomes of a yellowish colour, and fluid; and now, if examined, globules may be observed.

Suppose that you have to describe the condition of a discharge, perhaps in consultation, these are the principal distinctions. Good pus is like cream of equal consistence, and inodorous; then it may be unequal and curdy, or serous and thin; or thick, viscid, and slimy. (See Scrofula.)

A certain degree or stage of inflammation is necessary to the secretion of pus. Violent inflammation, as well as defect of action, will cause it to cease.

That pus is a secretion, we conclude from these circumstances—1. It partakes of the specific action. 2. It undergoes the changes incident to other natural secretions, as in fever. 3. It participates equally in the effect of mind. 4. Its varieties are produced by a change in the inflamed vessels.

From these considerations are drawn some not unimportant practical deductions.

A child having a habitual discharge from the ear; a man having a gleet which is suddenly suppressed; the pain and dangerous consequences are attributed to the suppression, when they ought to be attributed to the increase of inflammation,—to a degree of violence of action inconsistent with the secretion of purulent matter. The practice of leeching and fomentation is obvious.

On other occasions, as in wounds and ulcers, the secretion must be re-established by wine, bark, and stimulating fomentation.

The suppurative action takes place more readily in superficial parts.

This fact explains much. The suppurative action and ulceration taking place towards the surface, explains how

abscesses burst outwardly,—how foreign bodies, as balls, work to the surface. It is for the same reason, that the lips of a wound may have gone through the action of suppuration to secondary adhesion, whilst yet the bottom of the wound is an abscess. This, of course, must be cared for in the dressing.

Abscess.

Abscess is a preternatural cavity containing pus; a process of inflammation.

Pus in any of the natural cavities is not called abscess, and for sufficient reasons; an abscess has a peculiar structure, and undergoes certain specific changes. Empyema is not an abscess.

We distinguish *acute*, *chronic*, and *critical* abscess. An abscess forms in the cellular membrane; and we must attend to its formation and its structure.

If a limb be violently inflamed, as, for example, from gunshot or compound fracture, and abscesses form, they will be found in the great beds of cellular membrane. If the constitution should tend to the secretion of pus and the formation of chronic abscess, they will be found in the great deposits of cellular membrane about the trunk of the body, wherever the texture is most loose.

The first process is an increase of the natural secretion into the cellular membrane.[1] Then coagulable lymph glues the cells so as to circumscribe the deposit.[2] At first there is a whitish fluid secreted; it changes into pus, and increasing the part, is distended; the sides consolidate, and the abscess is established.[3]

[1] From this secretion of serum comes the œdema, which precedes abscess, and announces it to the intelligent practitioner.

[2] Proper, however, to the phlegmonous abscess.

[3] When the abscess is first established, it is often traversed with filaments, in part vascular, in part the remaining cellular tissue. In time these are absorbed or melted, but often the shreds of cellular membrane are left insoluted and sloughy, in the centre of the abscess.

The structure of the abscess, so to speak, is this. The external wall is thickened cellular membrane; it is lined with a smooth ash-coloured substance, a formation by the coagulable lymph which has become organized; from this surface the pus is secreted.

The presence of matter, and the formation of an abscess, is preceded and accompanied by certain signs; there is pulsating pain, heat, swelling, with irregular shivering.

When phlegmon and sympathetic fever are present, and there occur *rigors* or cold shivering at irregular intervals, they announce a change. They may mark the accession of fever, but they may be the mere effects of exposure and cold.* They will often indicate to you that you have failed in procuring adhesion, and that you may, therefore, change your practice.

If you have been interfering with any of the natural passages, by bougies or otherwise, the shivering may be attributable to that operation.

It would appear that the rigors are attributable to the distention and the formation of the cavity, as the matter on an extensive open wound is not attended with the same effect.

An abscess is not only resembling a natural part in its structure, but in this also, that its contents change, and undergo absorption and deposition; in a manner similar to the natural secretions into the cavities, and so sometimes after the matter is formed the abscess disappears.

It is sometimes recommended to open abscesses by caustic.

In doing this I have found the abscess disappear! an excitement being given to its walls, and absorption the consequence. So blisters, although used to accelerate the process of thinning the wall and pointing, do sometimes dissipate the abscess; and so in more chronic cases, electricity is used for a similar purpose.

When the abscess becomes prominent, and is about to burst, it is called *pointing*.

The pointing of an abscess is caused first by the consolidation of the sac with the skin, and the absorption of the intervening substance; thus incorporated, they waste, inflame, and ulcerate.

When the prominent point of the abscess has ulcerated and burst, and the matter is discharged, there is remarkable relief; and when you revisit your patient, you no longer see the flush of inflammatory fever, but you may still expect irregular rigors, loss of appetite, and peculiar paleness of the skin.

An abscess requires to be opened sometimes, and in particular situations early opened.

An abscess requires to be opened when under a fascia, for that membrane, possessing little vascularity, will long resist the progress of the matter outwardly. You open an abscess near the rectum, lest the matter should extend into the cellular membrane. So when an abscess forms about the throat, we open it, lest it ulcerate towards the irritable portion of the glottis, in which case it is apt to suffocate. See *Scrofulous and Cutaneous Abscess.*

The abscess thus having run its course, or being opened, and by that means accelerated, you have to guard against the formation of a sinus.

This you do by renewed attention to health. You take care that the matter has free exit. Then you perceive the cavity to granulate and fill up.

You may have to desire the suppurative process, and the formation of an abscess; in which case you moderate the

inflammation—diminish pain by opiates, joined to bark and wine—you steam the part, or apply fomentations and the maturating poultice—the flannel bag, with chamomile flowers and poppies—and in the poultice the resins and the warm gums. In the more chronic abscess, the gum plasters are applied.

There is a field of observation open between the two subjects of acute and chronic abscesses.

Thus deep suppurations form,—in part owing to the general diathesis, in part depending on some local irritation which directs the action.

1. For example, diseased bone causes an abscess in the neighbouring cellular substance. 2. Irritation in the rectum causes abscess by the side of it; such too are the abscesses about the throat. 3. Peritoneal inflammation causes suppuration in the abdominal walls. 4. Inflamed intestine abscess, and at length fistula in the side. 5. And most frequently of all, an inflamed lymphatic gland produces abscess external to itself, and in the surrounding mass of cellular substance. 6. And, lastly, the milk abscess, proceeding from distention of the milk-vessels in a delicate or strumous frame.

The following I should have thrown with other subjects into an Appendix, but it will serve to shew how abscess varies by slight circumstances.

*Whitlow.**

It is a phlegmonous tumour, occupying the end of the finger, attended with excruciating pain.

I have conceived it to originate in an inflammation of the vascular body which secretes the nail. The painful consequences are certainly resulting from the nature of the covering, and consequent confinement of matter.

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* Paronychia, Panaris, or Whitlow.

When not subdued, the whole hand and arm may become affected with pain and tension, and the artery at the wrist throbs powerfully. The lymphatics participate in the irritation, and there is pain in the axilla.

In this miniature representation of inflammation and abscess, you have an example of what may befall from apparently slight causes. *Erythesmus, delirium, lipothymia* (animi deliquium)—from disease in the point of the finger!

As to treatment, first distinguish the varieties. In strumous subjects, you have the—

Paronychia sicca, a swelling encircling the nail, which does not suppurate.[1] There is a *venereal paronychia*.[2] There is also a mild form of disease, which is a mere inflammation of the sensible extremity of the finger, the organ of touch.[3]

[1] Foment by dipping in hot water, and so you may in the commencement of the more troublesome form.

[2] Whether this be a true venereal symptom, or a consequence of a cahexy so induced, may admit of doubt. The progress of the complaint is slow. The matter loosens the nail, and there is a deep, foul, very painful ulcer; the bone often becoming carious, whilst the integuments of the finger swell with a peculiar firmness of texture.

[3] In which case you take care not only to let out the matter, but you must pare away the thickened cuticle, else the matter will continue to burrow under it, and to produce successive inflammations.

Distinguishing the varieties, the phlegmonous and suppurating whitlow requires active treatment; you must give freedom to the matter, and destroy the rising fungus.

When the matter is deep, says an old surgeon, there is no alternative; place the patient's hand on a mass of tow, hold him firm, and with the scalpel cut to the bone! All I have to say is, that it may be done effectually, and with

less pain, by passing inward a fine sharp bistoury, and cutting outward. Cut away the nail; touch the ulcer, and especially the very sensible fungus, with the blue-stone, and, according with the old advice, dress with the balsam copaibæ and tinctura thebaica.

*Chronic Abscess.**

In this abscess there is less phlegmonous inflammation—less action of any kind. It partakes of the constitutional peculiarity of struma, or it is attendant on an exhausted system. In short, it partakes more of disease than of the mere effect of injury in a state of health.

The chronic abscess forms in the great masses of cellular membrane about the back and loins. It is attended with slight inflammation,[1] and often, instead of being surrounded with a "stool" of adhesive and coagulable lymph, the matter drops from cell to cell, and appears externally at a part remote from the commencement of the disease.

[1] Which gives occasion to some to express the opinion that purulent matter may be formed without inflammation.

This character of abscess gives rise to mistakes; the absence of fever and of local inflammation inducing the surgeon to believe that there cannot be pus contained in the swelling.

Thus I have seen a surgeon commence his operation to *extirpate a tumour*, when the knife entered an abscess; so we have sometimes a difficulty in distinguishing a chronic abscess about the shoulder from an enlarged bursa.

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* Read Abernethy on chronic and lumbar abscesses, in his Surgical Observations.

Large abscesses require very particular treatment; and for this reason, when a large abscess is opened, there arises alarming symptomatic fever, which is dangerous in proportion to the extent of the surface of the cavity. This effect arises from the inflammation of the puncture extending to the whole interior surface, which is aggravated to a violent degree by a new cause, the putrescence of the remaining matter, for, by the admission of air, a chemical decomposition is permitted.

When you puncture an abscess, lay the flat head of your probe on the side of the lancet, and hold them firm. When you have penetrated to the matter, by a motion of your thumb introduce the probe further, and withdraw the lancet; or you may use the directory in the same manner; the groove of that instrument serving the purpose of a canula.

A grooved needle is employed for exploring a tumour in which the surgeon is uncertain whether there be matter contained or not.

The use of the probe or directory is to permit the matter to flow, and to prevent the necessity of much poking in the wound, which makes the union of the puncture uncertain.

If the abscess be small, the opening is made free, and a poultice applied; but, if large, you must puncture only, and procure adhesion of the lips, and thus avoid reaction and fever.

Some surgeons neglect the practice of Mr Abernethy, and reject his reasoning; in which, I think, they are very wrong.

In this operation there is both nicety and judgment required,—nicety in the dressing to procure reunion, and judgment to say when the attempt should be resigned, and large incision substituted for puncture. (See the treatment for Compound Fracture.) The operator often fails in procuring union by not supporting the sides of the abscess: first bring the lips very accurately together, seeing

that no clot or coagulable matter is between them, and no fat protrudes. Apply your adhesive plaster neatly; over that a compress, and over that a longer and broader adhesive strap: then use the compress of lint, and the uniting-bandage (a double-headed roller), so as to prevent the matter accumulating and distending the walls. You will be repaid by the constitution suffering no disturbance.

After a time you repeat the operation; and perhaps a third time. The abscess being diminished in size, it is finally opened to remain so.

The abscess may be opened by caustic.

Authors do not seem to know the intention of this mode of operating. The caustic may be used with the view of exciting the abscess to activity, as well as to open it by a slow process of sloughing. But it is used with a very different intention. When the caustic has been applied, and the wall deadened, the lancet is used to perforate through the dead part. The effect is to evacuate the matter, whilst there is time given for the contraction of the abscess, before the slough caused by the caustic separates by ulceration, and consequently before the irritation of the wound is propagated to the walls of the abscess.

If possible avoid the use of setons.

Although some deride the idea of depending orifices being of use, it is often necessary to make a counter opening. This may be done by passing the gunshot probe, and cutting upon it, or by using the instrument of Assalini.

There is some very ignorant writing on this subject. In the first place, a seton is not required for an abscess, unless there be irregular openings into neighbouring parts. It is used to maintain a free discharge in one direction; whilst the compress and roller is employed to procure adhesion in the recesses or sinuses of the cavity. A touch with the *kali purum* in the lips of the orifice will do the office of the seton, if it be intended merely to keep the orifice open.

This pressing out of matter from sinuses and preventing it falling down in the loose cellular membrane, was intended by the older writers by the use of the *fascia aposthema*

faciens et prohibens. Cases will occur where you dare not use the roller, and yet have occasion to support the limb against œdema, or gently to express matter. This is to be done by adding a portion of the *emplastrum plumbi* to an ointment, and spreading it on slips of linen: these are put obliquely round the limb one over the other, always taking care to make equal pressure, and not too much.

In treating abscesses, and with the intention of preventing them falling into obstinate sinuses, you must have recourse to your knowledge of anatomy, in order to keep the parts perfectly still, for very often spurious sinuses are kept open by motion, and friction of the parts.

Thus I have found an abscess under the latissimus dorsi, and under the trapezius, kept open by permitting the motion of the arm. Mr J. Bell was wont to narrate a case of fistula under the pectoral muscle, which had not yielded to injections, setons, compresses, &c., cured by the necessary bandaging on the patient's breaking his arm. When there are abscesses in the temple, it is necessary to keep the temporal muscle at rest by binding up the jaw. Sinuses after bubo in the groin are, in like manner, kept up by the motion of the part, and cured by strict rest, compress, and bandage.

Of the Hectic.

The Hectic Fever is that which accompanies local irritation, especially suppuration.[1] It is characterized by flushing, frequent weak pulse (from 100 to 140), night sweats alternating with diarrhœa.[2]

[1] When the paroxysm first appears, you cannot yet form a judgment; but you look anxiously for a swelling or tumour.

[2] A hectic most resembles a quotidian intermittent: the exacerbations are irregular; the chillness and the sweat recurring irregularly.

When the fever is confirmed, the patient loses flesh perceptibly; he is pale and debilitated, and without appetite; the urine copious, the mouth moist, and the tongue clean.[1] The judgment is always clear to the last.

[1] Preternaturally clean and bright on the edge.

Such being the character of Hectic, you become alarmed when there is paleness and emaciation, and increased heat after meals. The danger may be estimated by the nature and extent of the local disease.

Surgeons may be permitted to use the grand aphorism, *Remove the cause*, for on that all will ultimately depend.

When the surgeon can remove the cause, as by amputation of a diseased joint, it is wonderful to see the effect. The patient for the first time after months of suffering sleeps calmly, and often colliquative sweats and purging cease at once and altogether.

It is superfluous to fill a surgical work with the treatment of hectic fever. It is sufficient to say, that we must watch and check the perspiration, and watch, too, that we do not throw the action on the bowels; that we nourish with light food, and support with appropriate tonics.

CHAPTER V.

ERYSIPELAS.

THE human frame, by diet and restraint of action, by influence of atmosphere, and disturbance of mind, is generally removed from a condition of perfect health. Thus we become subject to an inflammation, which no longer partakes of the phlegmonous character; "that is to say, it is no longer the reaction of a body in health," or an action "tending to restoration." *Erysipelas* is "an exantheme."[1] It is, however, an inflammation of the skin, depending on constitutional derangement.[2] It is characterized by a bright red, partaking of a lake colour, and tinged with yellow, which becomes more evident in the progress of the complaint. The swelling is slight without induration. The colour disappears on pressure. It is always preceded by symptoms.[3] The inflammation is not limited; it extends irregularly. The heat is peculiar, and attended with a prickling pain like that of a scald, or from exposure to the sun. The inflammation properly in the skin, extends an influence to the subcutaneous cellular membrane.

[1] An objection perhaps to this may be, that exanthemata are contagious diseases, *et semel tantum afficientes*. It is doubtful if erysipelas be contagious.

[2] We can produce phlegmon—why can we not produce erysipelas? Is this not a proof that it depends on some state of constitutional disturbance?

[3] In going round the hospital, and seeing an erysipela-

tous blush round your patient's wound or ulcer, you will find on questioning him that he has felt unwell,—uneasiness in the epigastrium—bitter taste in the mouth—pain in the sockets of the eyes; and if he has not observed these, he will tell you of chills or shivering in the preceding evening. If he has been moving about, he will confess to heaviness of the limbs, loss of appetite, and headach and nausea.

You observe the distinction to phlegmon—here the general distress precedes the local affection. A dissipated life renders the individual more subject to erysipelatous inflammation on receiving a hurt, especially an abrasion or puncture of the skin.

Distinctions are made, as the *acute* or *phlegmonous*, the *œdematous* and *gangrenous erysipelas.*

Erythema, simple erysipelas, and phlegmonous erysipelas, are degrees of the same affection. To study this subject fully, the student ought to peruse his medical works, and return to these considerations.

Erysipelas of the Head.—Whether it be idiopathic, or consequent on wound or puncture, when a fiery redness extends from the scalp to the neck, and the face is swoln and the eyelids closed—1. you think of the typhoid character of the fever; 2. of the danger to the brain (a weak, rapid, irregular pulse, with a purple colour of the skin, will give token of the first—high delirium will warn you of the second); 3. you will watch for suppuration in the eyelids, and use the lancet early, for if neglected, the matter will work wide, with sloughing and consequent disfigurement.

With respect to the forms enumerated above, are these distinct diseases? We find in one case, that it may assume in succession the acute, œdematous, and gangrenous form.

The phlegmonous or acute erysipelas will be known by the higher degree of redness, more tumefaction, throbbing, with a fuller pulse.

In the malignant or gangrenous erysipelas, the patient exhibits more debility from the beginning,

and the colour of the skin is dusky. When there is great œdema, there are also vesications.

The slightest injuries will occasion an erysipelas, which shall be at once acute, œdematous, and gangrenous. Thus a man received a slight cut from an oyster-shell; in three days the arm was swoln from the knuckle to the shoulder—the skin was distended, œdematous, and with a granular appearance. In the mean time the face was flushed, and the eyes fiery—vesications—black spots, and finally extensive sloughing, took place on the arm.

Again, it will present in this formidable manner: An operation is performed—the patient on a sudden becomes restless and anxious—he complains of diffused pains of the limbs—an erythematous blush appears on the surface of the wound, and extends irregularly to distant parts; it is of a florid colour like scarlatina, and in a few hours assumes a dark livid hue. In the mean time, the patient is talkative, delirious, with parching thirst.

There is also an *erratic erysipelas.*

Erysipelas erraticum. We shall suppose a patient has hurt his knee, and that leeches are applied; a blush of erysipelas spreads from the leech bites up the thigh, and down the leg; there is a threatening of abscess; the early use of the lancet saves the skin; the erysipelas extends to the body, with more chills, and an increase of fever; the face is affected one day, the breast and loins the next; the symptoms by treatment become less violent, but still the inflammatory blush is shifting. In such cases the muriated tincture of iron is the best tonic.

Treatment.[1]—Be cautious in treating this disease as phlegmonous, for you perceive what the appearance of acute inflammation comes to.[2] Saline purgatives and antimonials are first employed, with warm diluent drinks.[3] If in hospital, let him be shifted immediately into an open well ventilated place.[4] When the tongue is foul and yellow, with a bitter taste and nausea, vomits are of service, with calomel

and opium at night, and in the progress of the disease bark and acids.

[1] Remember that errors in diet and improper tight dressing are frequent causes of erysipelas, and that one of the most intelligent of our surgeons has declared the surgeon to be more in fault than the patient.

[2] The application of leeches may be proper when the character is phlegmonous, and they may be applied to the inflamed part. It is true that leeches will produce erythema, yet they relieve in the acute form. Blisters have been recommended to stop the course of inflammation. I have not employed them; it is with more confidence recommended to draw the lunar caustic round the edge of the inflammation.

[3] You give solution of the sulphate of magnesia (or the sulphate and carbonate together), to which you add antimonial wine, and given in small doses every four hours, adding tincture of opium after the bowels have been relieved. The nicety of practice is to observe the diminution of power, and to change the practice to means which give support.

[4] Yet not exposed to a cold stream of air, which, indeed, I have often seen bring on erysipelas.

In slighter cases, you will find the chalk powder and cotton wadding the best covering. In most cases there is danger of the skin being isolated, and of a bad subcutaneous suppuration, or of mortification of the skin.

Although the disease is essentially in the skin, effusion takes place in the subcutaneous cellular membrane. This is especially apt to be followed by formidable consequences when the skin covers extensive fascia, for then it becomes isolated, and falls off in mortification.

It is therefore necessary to watch the first appearance of effusion, and to open the skin freely, using the scalpel instead of the lancet; otherwise the skin becomes undermined with matter and slough of the cellular membrane.

The propriety of free incision in erysipelas was first recommended by Mr Copeland Hutchison, and enforced with great severity and decision by Mr Lawrence.

If the lancet is used early there will be no occasion for large *incisions;* nor blame yourself when you find no matter, but only serum. When there is œdema, there is the feeling of fluctuation, but on puncturing only bloody serum is discharged, and tempted to go deeper, only blood.

Read Mr Lawrence on Erysipelas, Med. Chir. Trans. vol. xiv.—a most learned paper. Read Mr Copeland Hutchison on the same subject; Practical Observations on Surgery. Earle on Diffused Cellular Inflammation; London Med. and Phys. Journal. Mr Arnott, *ibidem.*

CHAPTER VI.

MORTIFICATION.*

LOOKING, as we do here, directly to practice, and eschewing theoretical discussion, we say, mortification is one of the terminations of inflammation; but it is essential to observe, that when phlegmon terminates in the death of the part, there is an essential omission in authors; it is the effusion and infiltration into the cellular membrane which checks and hinders the action of vessels.

Take care that you distinguish *ecchymosis* and *thrombus* from mortification.

A wheel passing over a limb often destroys the skin, while the parts beneath are alive. Extensive subcutaneous extravasation of blood resembles a complete mortification.

Gangrene is marked by a decline of the vital powers, preceded by exquisite pain, and perhaps a burning sensation in the part; there is a subsidence of the

* We might suppose that the death of a part admitted of no degrees; yet you find a variety of terms, and some of importance: Thus, *gangrene* we may take as the progressive state; *sphacelus* the complete death of the part. Traumatic gangrene is intelligible enough, as that mortification which is proceeding from wounds. The humid and dry gangrene will be dwelt upon in the examples of compound fracture or gunshot, which certainly may terminate in gangrene, but not until tumefaction has taken place to an inordinate degree; then come vesications and spots of mortification; the choking of the circulating vessels has previously caused debility, and imperfect supply of blood. See *Aneurism*.

tense swelling, and a substitution of œdema. Then appears a purple or livid spot, with phlyctænæ, or vesicles of a reddish fluid, and then emphysema.

When mortification pervades the limb, there is a dead weight, without sensibility or motion; the cuticle separates, and the smell becomes cadaverous.

When mortification comes upon a wound or ulcer, the surface becomes dry, and covered with a gelatinous tenacious matter. With these local appearances, the countenance exhibits anxiety,—then succeeds restlessness, wildness of aspect, and delirium; the pulse intermits; there is subsultus and hiccough —and coma!

The humid and dry gangrene was a distinction of M. Quesnai. The first is when high inflammation is attended with abundance of extravasated fluid; the other is where there is no serum exuded, and the drying of the part prevents putrefaction.

The dry chronic or idiopathic gangrene is the *gangræna senilis*. It is very often preceded by constitutional disturbance, restlessness and pain; there is no tumefaction. It commences in a small black spot on the side of the little toe; the skin becomes detached, and under this the skin is dark red; it dries; pain precedes the visible marks; then a purple darkness of the skin, which on the morrow is a mortified spot, and so the toes are in succession affected, and then the feet.

The cause is ossification of the arteries of the leg. But how frequently do we find these arteries ossified in the dissecting room without any such consequence? This informs us that there must be another cause—a state of constitution—and this gives us hope that, by treatment, we may arrest its progress.—*Read Pott on the Mortification of the Toes and Feet.*

When gangrene has taken place, we hope still that the mortified spots will slough and separate.

A whole limb may separate, when the hurt is local, and the patient young and of good constitution.

We look anxiously for a line of separation. This line is the rising of the cuticle, which marks the confines of the dead and living part. On the second or third day we find that ulceration has commenced. We often have to mark this as the period for amputation, as shewing a reaction of the system, which promises success if the dead part were removed.

Treatment.—Think if there be any source of debility in the state of the bowels; clean them out, and follow this with cordials, and all the means of supporting strength.

Diarrhœa attends, and, if not checked, rapidly wastes the strength. Bark and acid, aromatic confection, camphor, musk, and opium, are the means of supporting the constitution. But manage your resources; have some additional stimulus daily; and on the symptoms becoming worse, apply blisters to the nape of the neck, and fomentation and cataplasm to the stomach.—*See Ulcers and Hospital Gangrene.*

To the part apply fomentations, stimulants, and warm dressings.

A cataplasm of hot port wine is readily obtained in families. Use poppy fomentation (or with cicuta), sprinkled with camphorated spirit. Touch the sloughing edges with tincture of myrrh, or with diluted nitric acid. Lay pledgets of lint, with camphorated oil, in the chasms, and cover all with the carrot poultice, or common poultice with charcoal, or fermenting poultice.

Anthrax, Carbuncle.

Carbuncle is a peculiar form of mortification, appearing on the trunk, and in men of a certain age who have passed their lives in the full enjoyment of good living.

It is not a common occurrence in hospital practice, unless in reduced tradesmen, and the decayed butlers and porters of nobility.

It is a deep-seated, hard, immoveable tumour, circumscribed, attended with a sense of burning, and tending to mortification. Dark inflammation marks the spot with pustules like vesications, which breaking, discharge a dark sanies. It is preceded by rigors, depression of spirits, sickness, and sometimes delirium; and previous to these tenderness and fulness of the epigastrium, with a dry cough, and embarrassed respiration. It is often a sequela of typhoid fevers, and is an attendant on plague.

It is remarkable that it should occur on the body, not in the extremities; but something is learned by this—it is not common debility! As to the parts of the body where it forms, it is over the fascia, or expansion of tendons; for example, over the tendons of the trapezius, between the shoulders; or higher on the nape of the neck, over the *ligamentum nuchæ*. It is more dangerous when near the head, from the supervening of cerebral symptoms.

If left alone, there are numerous openings observable, and within the sloughy membrane is visible; but these holes are quite insufficient to discharge the slough.

As this complaint is attended with deep sloughing of the cellular membrane, it requires free and early incisions. You administer a calomel purge, followed with ammonia, bark, and wine; the treatment being that proper to the putrid fever. To the part you apply poppy fomentation, with sal ammoniac or spirits and camphor; the cataplasm of wine or effervescing poultice.

When it terminates favourably, it is by more kindly suppuration and granulation. The cicatrix is irregular, depressed, and puckered, and has long a brownish discoloration.

It is a very dangerous condition, and requires immediate and unremitting attention, lest the patient sink. It is often combined with visceral disease. If with a large carbuncle there is great prostration and syncope, vomiting, delirium, the danger is very great.

Consider the varieties; *e. g.*, *Benign*, *malignant*, *pestilential*, *malignant pustule.*

Do not mistake, and unnecessarily alarm yourself on the appearance of a bad boil or livid pustule (*furunculus*), which in an aggravated condition is troublesome enough. A boil is a small painful phlegmonous tumour of the skin, of a conical form, the base deep-seated, and on the apex there is a livid pustule. Sometimes it suppurates imperfectly, with a sloughy bottom. It is chronic, advances slowly, and they come out in succession.

You cannot disperse it if you should. You may attempt to bring it forward by steaming; but you had better cover it with plaster, and attend to the source of them, and to prevent others coming in succession, which you do by attention to the stomach, by an emetic and alterative pill, and by bitter infusion with alkaline solutions. When it looks ill, and exhibits a mass of corrupted cellular membrane, it should be dressed with digestive ointment and poulticed.

As to correcting the disposition to them, after considering the state of the intestinal canal, give antimonials, and order the warm-bath.

Be it also observed that, in the peculiar constitution to which the carbuncle belongs, abscess, as, for example, by the side of the anus and in the perineum, possesses much of the character, and requires all the attention which the true carbuncle does. The affection of the pudendum to which children are subject may be studied under this head.

CHAPTER VII.

OF WOUNDS.

You have now to apply these principles to the cases of wounds, which may be thus distinguished:

Contusions;
Incised Wound;
Stab or Deep Wound;
Penetrating Wound;
Puncture;
Laceration;
Gunshot Wound; and
Laceration by Gunshot and Shells.

Contusion is an injury by an obtuse heavy body, which neither cuts nor lacerates. But it may burst the superficial vessels, and injure the deeper parts without a breach of skin. Such an injury we are liable to from a fall.

Accordingly, you attend to the extravasation. The superficial vessels being burst, the force of circulation propels the blood into the cellular membrane, where it coagulates. The appearance is formidable, resembling mortification. *Ecchymosis, thrombus, sugillatio,* are the terms you hear.

Sugillatio means rather the livid spots of the scorbutic, where the blood is forced into the serous vessels. Consult your medical authors under *purpura hæmorrhagica.*

After a severe contusion, there is a yellowness which extends beyond where there has been direct injury. You see it in a sprain, which proves the discoloration to be an

effect of arterial action. This, again, should be distinguished from the mottled appearance in the dead body.

Ecchymosis is properly the effusion of blood from contusion. The skin is livid or black, and without tenderness.

Thrombus is blood escaping from a vein, as by a careless manner of bleeding. When by change in the position of the arm, the orifice of the vein does not correspond to the orifice in the skin. (See *Phlebotomy*). A vein may be burst by a fall or blow, and so may an artery. I have known a man, by falling on his buttocks, burst the gluteal artery, and have a tumour of blood extending from the false ribs to the ham!

The injury in contusion is not to be estimated by the weight or velocity of the instrument, but also by the resistance. Now, as the bone resists, the injury is often deep.

For example, a smart blow will produce ecchymosis, when the descent of a heavy body will not injure the skin, but the deep parts—the bone or a viscus. Connected with this subject, we may refer to the stories of the wind of a ball. Read Sir George Ballingall. But what is that which Mr Guthrie says, p. 232?

I have known a blow with a mallet cause deep suppuration in contact with the femur, and under both fasciæ and quadroceps muscle.

It is in these cases that the abscess lancet must be carried deep.

The applications to ecchymosis are camphorated spirit—spirit and vinegar—solutions of muriate of ammonia; leeches will not be of service. I speak of the state of the skin. The inflammation will be in proportion to the injury, and require the antiphlogistic treatment.

The *incised wound* is such a wound as may be given by the sabre, or the scalpel of the surgeon.

An open, free gaping wound, where there is no concealed mischief. It swells freely, and, by proper treatment, unites readily.

Of the bleeding from the general surface we have already treated.

If a muscle, or the fibres of a muscle, be divided, you study the anatomy to give perfect relaxation, or one of two things happen: there is a vacuity left between the cut surface, or the muscle protrudes from the wound.

You use the adhesive strap or dry suture, placing compresses on the side of the wound, and over these the uniting bandage.

The meaning of these compresses to the sides of the wound is, that the surface deep in the wound may be held together and supported. If this be not done, blood collects there, and afterwards matter. It is for this end that the quilled suture was formerly used.

Needles and ligatures are to be avoided wherever it is possible.

If it be said that adhesive strapping irritates the edges of the wound, and therefore the needle is used—the answer is, that your strapping is bad; and it is always possible, by the application of mild dressing on the edge, to prevent all irritation. For this purpose you use the chalk dressing, the *ceratum plumbi cum creta*. The piercing with needles, and the drawing of ligatures, endanger erysipelas, or irritation and swelling of the wound.

The dressing should be moistened, and the moisture allowed to evaporate.

Some affect to say that blood is the best dressing—the idea encourages negligence. Bring the edges of the wound very accurately together, and if any thing be required to exclude air, use the Peruvian balsam.

The stab or deep wound.[1]—The best idea that can be given of this wound is from the instrument from which it is named, "a bayonet wound."

[1] Authors treat this under "puncture," which is a very different matter. The *stab* is a most important distinction.

The danger here is of hæmorrhage, and of deep inflammation, and consequent swelling and tension under the fasciæ.

An example may be given in the wound by the small sword, in the sword arm, when the sword goes among the muscles and under the fasciæ. You can conceive that, even if an artery should not be opened, that there may be extensive thrombus or extravasation; hence the use of the sucker. See Mr J. Bell on wounds.

The wound being cleared of blood, a compress is to be laid in such a manner as to keep the sides together, and with the assistance of the roller the cold spirituous lotion to be applied.

But here there is a necessity for careful watch being held, lest inflammatory tension of the limb should come on; in which case the bandage will do incalculable harm.

It is in this wound that we are to expect contraction, from the swelling of the parts under the fascia. In which case, incisions must be made freeing the fascia as you would a tight bandage.

There is much said on the inflammation of the fascia; but I apprehend that the cases referred to under this head are inflammations of the cellular membrane under the fascia. See in these cases that you study the connections of the fascia, (for example, that of the fore-arm), and that you make your incisions anatomically correct, and not needlessly.

You perceive how this wound may be complicated—the bloodvessels opened—the cellular membrane injected—the

injury deep and extensive—the swelling of the limb general—the discharge dark coloured, fœtid, and confined. This requires all your judgment, or deep abscess and carious bone are the result.

The *penetrating wound* is a term which designates a very important circumstance: it is where the cavity is touched, the serous lining membrane perforated.

A boy is climbing over a railing; his knee slips, and the pike runs into his body: then the question is, Has it penetrated the peritoneum? If it has, he is in the greatest danger; if not, it is a "flesh wound" only.

In this wound the attention must be directed to obtain adhesion. If the membrane unites, or if the bowel adheres so as to close the wound, it is from that moment a simple wound, and the danger is past. But if the lips of the wound remain separate, and if, as in that case they must do, inflame and suppurate, then the action is propagated over the whole surface of the cavity, with pain and tumefaction and sympathetic fever.

Every means of subduing inflammation and inflammatory fever must now be employed.

Puncture.—This seemingly trifling wound is sometimes attended with serious consequences. It is as if a small wedge tore aside the fine nervous texture. Hence the pain and nervous derangement from pricks in the fingers and under the nail.

There arises a cellular and lymphatic inflammation, which sometimes terminates fatally.

You fear serious consequences when there is painful throbbing; when there is a red line along the lymphatics of the arm, and pain and swelling in the

arm-pit; for there may come fever and oppression of the chest.

Mere irritation will do this without poison. Thus in the hospital we have the char-woman with a hurt hand, or washerwoman will come with her hand and arm swoln. What is this? "A poisoned hand, Sir." But the poison is only the irritation excited by yellow soap. My practice with the youths in the dissecting room has been to touch the point with the lunar caustic, to order a poultice with solution of opium and cerussa acetata, and to hurry them off to the country.

Punctures about the hand and fingers are attended with that cellular inflammation which, running under the fascia and among the sheaths of tendons, produce indescribable distress. The hand swells up like a boxer's glove, deep suppurations form, requiring to be opened; and when you save the hand, the fingers are too often drawn up and contracted by adhesions between the thecæ and tendons.

Punctures such as are made by the tongue of a buckle or a dissecting hook, are attended with serious consequences when the person wounded is out of health. Thus our young men become subject to serious consequences from puncture towards the end of a long season, when a confined London life and study in the dissecting room and hospital have produced a peculiar debility.

There is something, however, in putrid matter which makes a distinct case. Be careful not to puncture your finger in opening a body with inflamed intestines; or to put your hand, having a wound or sore upon it, into the abdomen of a woman who has died of puerperal fever.

Lacerated wounds.—The lacerated wound is characterized by (comparatively speaking) being unattended with hæmorrhagy: the fibres torn out are paralyzed; the bloodvessels injured, so that coagulation takes place in their open orifices. A lacerated

wound implies also the drawing out and tearing of nerves, and hence the danger of tetanus.

You will read of the miller in Cheselden's work whose arm was torn off. The occurrence is more frequent now by the extraordinary increase of machinery. A boy was brought into the Middlesex Hospital who in a manufactory had got his arm entangled in a rope, which drew him up, and carried his arm through a hole in the partition; his body fell to the floor, whilst his arm was carried into the other apartment: there was no bleeding, and he survived! Children in manufactories are very frequently dreadfully lacerated, and their hands and arms torn to rags. In old people, in addition to tetanus, we have to dread erysipelas in these wounds.

It is a wound unfavourable for adhesion.

But there is no reason why it should not be attempted. I have known the side torn open by a bull's horn heal by the first intention; and so it happens daily.

The treatment is essentially the same as in the case of incised wounds. But if either tetanus or erysipelas threaten, then tepid anodyne lotions must take place of the balsam dressing and cold application.

We find peculiarity of each of these wounds combined in gunshot wounds; but as the subject of hæmorrhage is also embraced in these, we shall first attend to Hæmorrhage.

CHAPTER VIII.

OF HÆMORRHAGE.

We advance to a very important subject, one which, indeed, is paramount, that requires science for its foundation, and which happily has been remarkably improved by the contributions of British surgeons. Loss of blood is an appalling occurrence for any one to witness; and for a surgeon to see a patient draining of blood, and beyond assistance, is of all situations the most painful.

The student must advance to this department through a laborious course of study;—the structure of an artery, its sheath; the nature of the blood, the powers circulating the blood. He will find his lessons in *Mr Hunter*, in *Mr J. Bell*, *Abernethy*, *Scarpa*, *Jones*, and *Hodgson;* and still he will discover that some essential circumstances have been neglected in all of them.

On reading the Report on this subject in the year 1816, I find nothing to retract. See my *Quarterly Hospital Reports.*

The signs of hæmorrhage might be considered superfluous, if the loss of blood were always apparent; but it is not so. I have seen patients lost by internal hæmorrhage, from the surgeon not knowing the danger in which they were.

In uterine hæmorrhage: in bleeding into the cavities as of the abdomen or thorax; in the draining of blood into a great abscess after they have been opened.

There is insatiable thirst; he is ashy pale, with lividity about the lips and nostrils; he begins not to see those about him, and a mist is before him, and

he is staring wildly; his hands are abroad; he feels suffocating; he grinds his teeth; the pulse is weak and compressible; he *faints.*

Lay the patient down, that the circulation within the brain may be maintained. I have just lost a friend by the stupidity of those about him. He had fainted many times, and recovered on being laid low; but wanting his usual attendants, they held him up—till he was irrecoverably gone! See hæmorrhage by the bursting of the saphena vein.

The quantity which a person may lose and yet retain life, varies with the nature of the hæmorrhage. Whilst it drains from a small vessel, the powers circulating readjust the measure to the heart. But a few jets from an artery, as the artery of the groin, prove suddenly fatal; the patient faints, falls back, and if the blood flows, on recovery he expires.

Whilst the surgeon may take advantage of a faint to proceed with an operation, do not follow the advice of bleeding a patient *ad deliquium*, in order to operate without pain; the practice is dangerous. If the stimulus of the knife does not restore your patient to sensibility and *suffering*, the means you use afterwards may fail!

All that is most important in this subject is to be drawn from the changes which the artery undergoes; yet is hæmorrhage from the veins not to be considered lightly.

The bursting of a varicose vein in the leg may, if improperly managed, bleed the woman to death. A wound of the external iliac vein is equally fatal with the wound of the artery, being within the valves. Wounds of the veins in the neck prove fatal, by air drawn into them, &c. The inflammation of veins is a very important subject, being very frequently the cause of death in modern surgery.

Of the resources of Nature in stopping Hæmorrhage from an Artery.

What has been omitted by all authors is, the relation which is established between the living coats of the artery and the living blood; that it is the influence of the artery which preserves the blood fluid, and that, deprived of this influence, it coagulates.

Distinguish between venous and arterial bleeding; the difference has sometimes been overlooked, and an operation upon the artery unnecessarily performed! The blood flows uniformly, and is of a dark colour when it proceeds from a vein. It may be stemmed by pressure below the wound, and it can always be stopped by compression on the wound itself.

Therefore the loss of blood tends to the closing of the orifice by coagulation, 1*st*, By the diminished force of circulation; 2*d*, By the tendency which the receding powers of life have to cause coagulation.

It is on this principle that, in wounds attended with hæmorrhage in the cavities of the abdomen and chest, you desire to produce deliquium, that the clot may form in the mouth of the bleeding vessel.

On the same principle an artery bleeding stops if it be disturbed, but continues pouring out blood if opened without injury to its coats.

Many years ago I shewed that, if an artery was bleeding during an operation, and you took your forceps and pinched it, it would cease bleeding. The intelligent reader will see how this touches on the subject of the *torsion* of arteries, which is nothing more than a mode of injuring the coats. The same principle explains why it is that, when a limb is torn off, the person does not die of bleeding, as he would do were it cut off and left so. It shews how a piece of glass

will cut an artery with so little injury that the person will die of hæmorrhage, when, if the same artery be cut across with a ball, it will not bleed at all. See Wounds of Arteries.

When we examine the mouth of an artery in which the blood has stopped spontaneously, we find a clot over the mouth of it entangled in the cellular membrane.

This we see also in operation. If in extirpating the mamma or other tumour, a vessel springs, and the assistant puts his finger upon it, the blood is coagulated, and you see a red spot; and so the artery stops. But remember that, when the patient recovers, and the pulse rises, and the heat is restored, the force of circulation may brush off this clot, and fill the integuments with extravasation. Be it observed, that nothing keeps the blood fluid but the inner surface of its appropriate vessel, artery or vein; as soon as the blood escapes into the cellular membrane it coagulates; even getting between the coats of the artery it coagulates. See *Aneurism.*

Thus an artery being wounded bleeds furiously, and *per saltum;* the blood flows more weakly—stops—it breaks out a second and perhaps a third time, and the patient being exhausted, it stops finally; and if opportunity be given, its mouth will be found stopped as above.

A man of genius values what he has discovered, and respects the thing in others. Dr Jones was wrought upon to be unjust. His external and internal coagulum were matters better explained by Mr John Bell, who also shewed the danger of trusting to this state of the vessel.

But this coagulation and the arrest of the blood is aided by circumstances; and, *first*, by *Retraction.*

If the artery being cut across retracts, it is obvious that, before the blood can escape from its mouth, it must encounter the elasticity of the artery, and that as much force as

is required to stretch the artery is taken from the impulse with which the blood flows from it. Thus if, in bleeding from the temporal artery, you open its side, you obtain blood; but desiring to stop it you cut it across! The same reasoning explains why an artery opened by the splitting of a bone bleeds in a formidable manner, although the vessel be of insignificant size: Example, bleeding from drawing a tooth; bleeding from fracture of the tibia, the nutritious artery of the bone being torn, &c. the contraction being prevented by the cancelli of the bone.

And, in the *second* place, by *Contraction;* for when an artery is divided in the living body, the mouth is pursed together in a remarkable manner.

Thus whilst we observe the manner in which the state of the artery *mechanically* tends to the stopping of the hæmorrhage, we see the much greater importance on this subject of attending to the condition of life in the vessels, and the influence of it on the coagulation of the blood, and the formation of the clot.

From the manner in which the labours of Mr John Bell have been received, his spirit would be well employed in exposing the vanity of writers who yet did not comprehend the very first principles of this great subject.

In advancing to the next head of inquiry, you study the vascular structure of the artery, the *vasa vasorum;* for on the action of these the final security against hæmorrhage depends.

The injury which the vessel has received excites an inflammatory action on its coats; they swell with deposit of coagulable lymph, and the inflammatory crust takes place of the coagulated blood. Then only is the vessel securely closed, the artery being obliterated.

Mr Travers shewed how a hole in an artery being punched, may heal; but when an artery is opened in a cut (as

shewn by Mr J. Bell), it enlarges instead of closing, and the security is the adhesion of the coats, and consequent obliteration of the cavity of the artery.

Of Styptics, the Cautery, and of Compression.

It is now easy to understand the effects of styptics, that they injure the living coats, and thereby facilitate the coagulation of the blood, and consequent plugging of the mouth of the artery. Whatever hurts the artery will be a styptic.

A styptic is supposed by Mr Abernethy (Lectures, p. 206) to act directly on the blood. I must have experience of this before I believe it.

Exposure of the vessel tends to stop the bleeding; and thus the common air is a styptic. So wine and spirits, mineral acids, alum (in solution or in powder), sulphate of copper, are styptics. See the History of Styptics in Mr John Bell's work.

To use a styptic, dip a dossil of lint in muriated tincture of iron, and apply it directly to the artery, supporting it with the compress and uniting bandage. As they are injurious to the general surface of the wound, they are seldom employed.

The actual cautery is very seldom used, yet it is held in reserve in desperate cases, and fungous surfaces and deep cavities.

The effect of the red-hot iron to the coats of the vessel cannot be misunderstood after the preceding sentences. It kills, and by killing, stops the flow of blood. The horror with which it is contemplated is needless and absurd. It is not a painful operation. But there is a better reason against its use in bleeding from *large arteries*, that the slough will, after a time, be thrown off, and the hæmorrhage return.

Compression is a legitimate mode of stopping hæmorrhage, but it must be done both scientifically

and with mechanical correctness. The compress must be in contact with the artery.

The *graduated compress* is a succession of compresses of folded lint; one, small, is put down upon the bleeding point, a larger over it, a larger over that, so that the whole has a conical form, the apex downward, and pressing upon the artery. Sometimes a small dry piece of sponge is put down on the orifice of the vessel, the graduated compress over it. Over the lint the double-headed roller is applied; and you take care that the limb is uniformly supported, otherwise there will be œdema of the limb.

Such a mode of compression fails, from the fascia or flat and cellular membrane or coagulum being between the compress and the artery, by which means, although it be effectual by mechanical pressure at first, yet as the vessel is not injured nor inflamed by contact of the foreign body, there is no glueing by coagulable lymph, and when the roller slackens there is bleeding!

Compression may be made effectual—it is a resource—but I do not recommend it.

Of the Ligature—Use of the Tenaculum or Needle—of the Common Needle.

The ligature is alone to be trusted in bleeding from divided arteries; it is the easiest, the least painful, and the most effectual mode of securing an artery.

The ligature puts a mechanical stop to the hæmorrhage; it also stimulates to the reaction of the living vessels, and the adhesion and final obliteration. In this double office it should be considered, to arrive at just principles.

At the time when writers on surgery ran away with the idea that the action of a ligature was to bring the inner coats of an artery into the state of an "incised wound," I foresaw what follies would be committed; and as at that

time I had a large class of intelligent students, I made the experiment to shew that it was the presence of the ligature as a foreign body that excited the coats of the artery. I placed a circular ligature around the artery, letting it lie in contact with the proper coat of the artery, *without drawing at all*, and shewed them the artery stopped by a clot!

It is not necessary to draw the ligature so as to cut the inner coats of the artery, and it is not safe unless in young and healthy subjects, and in amputations.

You will observe that the important consideration is the mode in which a ligature should be employed, in old arteries subject to aneurism. It is very dangerous to apply the experience acquired in operating upon the healthy subject to the subject of aneurisms—far less is it safe to draw conclusions from experiments on brutes! Any mode of securing the artery will do in the young and healthy individual, and in amputation.

I foresaw the effect which would follow Dr Jones's experiments, that surgeons would be nicking the coats of the artery, by applying a ligature and taking it off again. It did not succeed in the very best hands. Mr Dalrymple of Norwich tried it and failed. Mr Travers has written some ingenious papers on the temporary ligature in the case of aneurisms. But he has peculiar merit in resigning the use of it.—*See Med. Chir Trans.* vol. ix. p. 415.

Asalini of Milan, and Dr Crampton, Surgeon-general of Ireland, have, with the same hope of improving the operation of aneurism, simply compressed the artery for a time sufficient to form a clot. I advise you to employ the ligature as I have described it. S. G. Crampton's valuable paper is in the 7th volume of the *Med. Chir. Trans.*

Another folly has been the substitution of catgut for the common thread ligature, under the idea that, being an animal substance, it would dissolve and be absorbed. It does dissolve and get loose, and abscesses form where it lies. See S. G. Crampton's case, Med. Chir. Trans. vol. xvi.

Use a ligature of two or of four threads, accord-

ing to the size of the artery; take care that, in preparing it, the threads are laid parallel, and waxed and oiled before it is applied; tie with a simple knot, and tie it again. Be sure, where the case is of importance, that the ligature is in contact with the coats of the artery, that neither fascia, fat, nor even the sheath intervene. Do not cut off the ends of the ligature, but twist them together into the smallest compass, and lay them down on the side of the wound; and if there be many ligatures, arrange them, and mark the one that is on the principal artery by knotting it.

The common error in applying the ligature is including a portion of cellular membrane and sheath. The consequence is, first that the vessel is protected from the contact of the ligature, consequently it does not inflame; and, secondly, the substance included in the ligature wasting, the mouth of it is open!

Mr Lawrence, in the Med. Chir. Trans. vol. vi. p. 156, treats of some important subjects, but the chief part of the communication is on the *ligature of arteries*. He is the advocate for small hard single thread ligatures, which he cuts off short by the knot. This was a practice of John Bell's, and which I did not approve of then, nor do I now. The object is to procure immediate adhesion, which, it is alleged, is prevented by the common manner of retaining the ends of ligatures. I have seen patients under the hands of good surgeons, shrieking and complaining of their toes, when ligatures were put on the arteries on the face of the stump. In matter of fact, the ligature often includes the nerve. Conceive, then, the misfortune of having a fine hard thread firmly tied on a nerve, and the ends cut off—conceive the distress, the pain, the tic, thence arising! and you will not follow this fashion—for it is but a fashion. Long after the stump should have been well, ulcerations have been occasioned by the ligatures being cut short, and the noose left.

Some writers on surgery do not seem to know the

practical advantages of a tolerably thick ligature, both ends being permitted to remain. When the time arrives in which these ligatures are to be taken away, nothing is more easy: the ends are twisted, the noose tightened. If the ligature does not come away, fasten the ends thus twisted up the side of the wound, and on the next dressing a further twist brings them away.[1] If this be not done, the surgeon is obliged to tug directly on the end of the vessel, and he may disturb the coagulum. The same consequence results when the surgeon cuts away one of the ends of the ligature, for then what remains cannot be twisted.

[1] Just before I left London this occurred to an hospital surgeon. On going his round he began to be ashamed of the state of a stump, kept open by a ligature hanging from it. He, resolving that this should no longer offend him, took hold of the cord and violently pulled it away, when there came a jet of blood full from the femoral artery!

If the ligature be not twisted, and if the threads lie loose, which they are apt to do, they get entangled in the granulations.

Use of the Needle and Ligature.

However the discovery, as it is called, of the needle has been lauded, it is a very awkward and imperfect operation. The needle being threaded with a triple waxed thread, the point is made to enter deep by one side of the bleeding orifice. It is brought out and again entered at the point at which it came out, so as to make another dive, and come again out on the side opposite to where it first pierced; the needle being cut off, the two ends of the thread are tied

and drawn. You at once perceive the imperfection of the operation, and that it possesses every disadvantage; that it embraces too much, probably the artery, vein, and nerve, and sheath, and at all events a quantity of cellular substance must be included; and that, therefore, it is insecure by the wasting of the included substance.

In using *the tenaculum*,[1] you pick up the orifice, trying rather to transfix it with the point when your assistant throws round the ligature and ties it. The Asalini forceps is an excellent substitute for the tenaculum when you have no assistant. You seize the orifice and let the instrument hang, and place round the ligature with your own hands.[2]

[1] Mr Samuel Cooper is justly severe on a bad drawing of mine, which represents the tenaculum and ligature. I could have wished many observations of his had been as well founded, it would have saved some of us a deal of trouble.

[2] Some young men perform this office very awkwardly, and pull off the ligature. You ought to take the ends of the ligatures in your hands, and force them down into the cavity of the wound with the ends of the forefingers. The ligatures are then, by a motion of the hands, drawn over the ends of the forefingers as over pullies. If you do not contrive this, the knot being in the depths of the wound, and you pulling outwardly, you necessarily pull the knot off the vessel.

When there is a small bleeding orifice, as from a callous ulcer, or from the glans penis in a state of ulceration, you may use the common housewife needle in this manner. There is no thread in the needle; you mark the bleeding point, and passing the needle in at one side you bring it out at the other. It is of little consequence whether you transfix the bleeding vessel or not, for on throwing a ligature over the

needle and tying it, you draw tight the surrounding substance; next morning you withdraw the needle, and let the ligature remain; it falls off in time.

Of Secondary Hæmorrhage.

Secondary hæmorrhage is when, after the surgeon has performed his operation, the blood bursts out again. It should perhaps be confined to hæmorrhage from the bursting of the coats of the artery upon the ligature, a subject of paramount importance. It has two causes—1. the ulceration of the coats where the ligature presses; and, 2. by sloughing of the artery where the clot has become loose, or has not extended far into the artery.

The ulceration of the artery may take place from the high irritability of the subject, and the forcible pulsation of the artery against the ligature. Hence the importance of health in all operations on the arteries. Thus I find in my notes, "Uneasy, no sleep, irritable countenance, dead feeling in the limb, dry tongue, breathing hurried, abdomen tender; on the 7th the artery burst." The sloughing takes place from dissecting the artery too much from the surrounding cellular substance and sheath, consequently cutting off the *vasa vasorum*, leaving the vessel dead. Secondary hæmorrhage is also induced from the imperfect formation of the clot, and that from tying the artery at a part too near the going off of a branch.

A double ligature has been employed; when the surgeon feared the security of the first ligature, he has placed another above it, either loose to draw if required, or drawn to a degree so as to take the force of the circulation from the principal ligature; all which is bad practice.

In reviewing this matter of the ligature of arteries, I fear

I do not express an opinion agreeable to some of my esteemed friends, when I say I have learned nothing by their ingenious inventions, since I left Edinburgh in the year 1806; and this I attribute to the neglect of that principle, drawn from the consideration of the mutual influence of the vessel and the blood—*that the injury of the coats of the vessel is attended with the coagulation of the blood.* Ignorance of this principle led to the idea of Dr Jones, that it was necessary to cut the vessel with the ligature—that to the employment of small ligatures of the thread used by the dentist—that, again, to the cutting of the ends of the thread, and leaving the knot in the wound to be buried in the adhesions. Then came the practice of using silk, and then of catgut or stripes of leather, under the idea that the material being of an animal nature it would be absorbed! To which, we may add the ligatures of lead and of gold, under a new fancy, *that they irritated* less!! If to these we join the practice of Scarpa, which was intended to bring the sides of the artery together without cutting them, by means of six threads waxed flat like a tape, having in its embrace a rouleau of lint along with the artery, we must conclude that, with all this praiseworthy activity, there was displayed a want of just principles.

The conviction that my brother's conversation and practice left upon me was, that the artery should be firmly tied with a moderate sized ligature—that the surrounding parts should be disturbed in the least possible degree, and care taken that, whilst the thread was within the sheath, and in contact with the proper coats of the artery, the *vasa vasorum* were to be preserved entire. After all these inventions, the sarcastic remark of Mr John Bell is applicable, when he rejected the *ligature d'attente*, and all other mechanical precautions—and the *rule* stands just where it was.

If surgeons had attended to the fact, as I originally announced it, that the blood would coagulate in an artery which was hurt "by a twitch with the forceps," we should not be in admiration of the "torsion" and "froissement" of the artery by M. Thierg, nor the "acupuncture" of M. Delpeau.

I shall say little here of the *tourniquet.* It was an

important improvement, and continues to be a most useful instrument.

Read Sir Stephen Hammick on Amputations, p. 49.

When Sir Astley Cooper embraced the thigh with his powerful hands, to shew that amputation might be performed without it, and that if it failed you had the resource of compression, he did not mean to give sanction to the vanity of not using it on proper occasions. If you have stopped a bleeding by the tourniquet, consider that you have stopped also the circulation in the whole limb; and ask yourself how long an extremity may be left without circulation? and especially remember, that it is a state of suffering so great, that the wounded man will loosen it, encountering death rather than suffer the pain. For this reason the compress and roller is generally better security against bleeding in recent wounds. See *Amputation, Aneurism in the Arm, &c.* I have known the tourniquet, improperly used, crush and open the femoral artery. For occasional use, he does not deserve the name of surgeon who cannot make a tourniquet out of a saddle flap and girth.

See *Wounded Arteries and Aneurism.*

It is always possible to command the main artery of a limb by pressure. Indeed a slight pressure is sufficient, if it be direct on the artery.

Mr John Bell has said, it is one thing to suppress the pulse in the lower part of the limb, and another thing to stop the course of blood. He never made a more important observation. I was present at an amputation at the shoulder-joint, when the assistant compressed the artery above the clavicle. The surgeon felt the wrist, and there was no pulse, and set to his operation. When the artery was cut across, the blood flowed out *pleno rivo!*

I should be very cautious in criticising Mr Guthrie—one possessed of so many excellent qualities as a man and a surgeon. But when the worthy Baronet Sir James MacGrigor recommended Mr Guthrie to attend my lectures, he might have heard an explanation of this aphorism of my brother, which might have saved the criticism in page 165, *on gunshot wounds.*

Although no man has done more to confirm our notions of the free inosculation of arteries than Mr John Bell, yet he was mistaken on one memorable occasion. In a case of operation on aneurism in the thigh, the blood having sprung, he undertook to suppress the bleeding; but although he pressed his thumbs with all his power on the inguinal artery, the blood continued to flow! On which the late Professor Russell got above him to add weight to his energies, but both together could not command the bleeding. Now this was the reason of his opinion so strongly expressed—and the rule is a good rule; but, for a reason which in after life I had abundant proof of, the blood did not pass by the artery which these gentlemen compressed, but by the collateral circulation: and so remember it will, unless, whilst you press the main vessel, you grasp round the limb.

Of Wounded Arteries.

Look to my Surgical Observations, Report on the *Ligature of Arteries.*

In addition to the principles laid down under the head of *Hæmorrhage*, a few rules on the operation on arteries *accidentally wounded* may enable us to conclude the subject.

Before we can say that an artery of a certain size requires a ligature, we must take into the estimate how it has been opened, and by what instrument.

A girl cleaning a window puts her hand through the glass and cuts her wrist, wounding the radial artery; she will bleed to death by successive hæmorrhages from such a wound.

A gunshot through the wrist or hand does not require a ligature.

There are extreme cases, illustrative of a principle already laid down, that the injury to the coats deprives the blood of that which alone keeps it fluid. A surgeon having thought

proper to amputate the fore-arm for a gunshot fracture of the further end of the ulna; I examined the artery, and on introducing my probe found it stopped for the length of an inch and a-half. (Case of Mackenzie.)

A ball shattered the angle of the jaw, passed obliquely through the tongue, came out by the edge of the mastoid muscle; the nerve of the tongue was cut. The wound bled for half an hour, and then stopped.

A sword passed in this direction would have required the ligature of the carotid.

As a knife or lancet, or piece of glass, will make a wound of the radial, ulnar or tibial artery, that demands the operation of a ligature, How is it in the case of a splinter wound? It will depend on the character of the wound; *i. e.*, the force with which the splinter is driven, &c. (Case of Niel.) Read on Gunshot Wounds.

An attempt was made some years ago to render the cutting down on an artery an easy and certain operation, by lines drawn with mathematical precision on the exterior of the body. It is dangerous, and will lead the operator into confusion and difficulty; trust to nothing but an accurate knowledge of anatomy.

Do not suppose that the limb is in the condition of the dissected body, or even of the natural and living frame; for very often it happens that, from the inflammation attending the wound, and possibly from the attempt at suppressing the hæmorrhage, the limb is unusually swollen. If you have to cut down upon the artery, you are surprised at the depth of cellular substance.

Thus I have seen a surgeon begin to cut for a ball, or to lay bare an artery; but not having calculated on the depth of firm œdema, he has been puzzled, and resigned the scalpel to another.

Another thing to be considered is, the gorging of the limb with extravasation.

Often it happens that, in a wound with profuse bleeding, the attendant, or even a timid surgeon, closes up the wound, and applies a dressing sufficient to prevent the outward flow of blood; but the limb is injected with it.

When a limb is thus gorged, and you are cutting down upon the artery, the general form is no direction; but the point of bone stands you good, the clear tendon will appear among the bloody cellular membrane: and this is the meaning of the recommendation I gave you in the introduction, to study the direction of the tendons in reference to the position of the artery.

Wounds of the arteries in the palm of the hand, and by the outside of the thumb, are very troublesome.

You may close the wound, put on a compress, make the patient grasp a body like a hand-ball, and roll the hand in this position. But if the compression be imperfect, then not only the bleeding returns, but the hand is swollen with inflammation and with extravasated blood.

When the hæmorrhage returns in a swollen condition of the hand, it is often impossible to pick up the bleeding orifice, and indeed the blood flows from several points; and you are forced to tie the ulnar or radial arteries at the wrist.

There are abundant cases recorded of disaster proceeding from bad surgery in wounds of the hand; and the surgeon, after bungling in attempts to secure the artery, has finished the series of errors by amputation.

The inosculation of the exterior of the hand and of the foot are so free, that, when you have tied the

artery, in half an hour the bleeding recurs by the circle of inosculation; therefore you will have to compress in the course of the inosculating vessels.

In these cases you contrive to compress in the course of the artery, leaving the circulation in the hand or foot free. For example, in the foot, when the anterior tibial artery is bleeding, as it goes forward on the foot, you place a fragment of splinter across the sole, and another across the instep, over the compress, the sticks being tied together, you twist the cords so as to press down the upper stick upon the artery, and to any degree you choose.

The radial and ulnar arteries should be secured above and below the division. I have seen the blood coming from the lower mouth. I am surprised that Sir George Ballingall should, for these accidents, have tied the humeral artery! We must place against him the case narrated by Mr Abernethy, where, after tying the brachial artery, the hæmorrhage returned from the lower end of the ulnar. (Lectures, p. 203.)

"A gentleman was wounded in the fore-arm by a pistol shot. The arm swelled prodigiously; abscesses formed in the fore-arm; and it was thought necessary to open them freely, and to rip up the fascia: in doing this, unfortunately, the radial artery was touched. The bleeding was profuse; and from the weakness of the patient, critical: my reader may conceive from what has been described, that nothing would be so easy as to compress this artery; but let him consider things as he will find them in practice. The man's arm is swoln to half the size of the body; great abscesses are in it; it is inflamed and so painful, that a heavy foot in the room, or the lifting of the thumb of the patient, gives excruciating pain. It is evident that the wound cannot be effectually stuffed and compressed when in this state. I know not on what grounds the surgeon determined in the preceding instance, but he took up the humeral artery, and

not the radial artery. Still the bleeding continued. This put my notions of the effect of ligature into strange perplexity. Still the patient bled, and what could be further done?—and in a short time he died. On dissection, I found the radial nerve with a firm ligature around it, but the humeral artery was not included. I never had seen the radial nerve mistaken for the humeral artery, but this was the third time I had found the radial nerve with a ligature around it.

"This is a pure case of a division of the radial artery, by the knife, proving fatal; and these cases leave no room for conjecture on the difference between gunshot wounds, those by splinters, and the clean cut of a knife. It is in this latter case especially that we have to cut down upon the artery and take it up."

In wounds of the arteries (and of the arm more especially), you must learn the position of the member when the wound was inflicted. For example, when a man is aimed at, he is in a position of resistance or defence; so that the assassin's knife strikes obliquely through among the muscles; and in such a case, when the attempt was made to secure the artery, I have seen great confusion and difficulty.

It is owing to this that sometimes it happens, that, although the artery be struck, it does not bleed, even when an incision is made to lay it bare! Because the muscles in their new position—*i. e.* the position different from what they were in when the blow was struck—have closed upon the wound in the artery.

When the wound is made, we shall suppose, obliquely from without, and the instrument has not passed through the arm, it is proposed to enlarge the wound. The thing is impossible. All you can do is to introduce the ball-probe in the track of the

wound, and cut upon it, and enlarge that counter opening so as to shew the artery.

The whole case narrated in my Surgical Reports—a wound of the humeral artery—p. 271, may be read with advantage.

If the artery does not bleed when thus exposed, compress it below—*i. e.* farther from the heart; it will then give out its blood.

In passing the blunt needle round an artery, be careful to be within the sheath, and also to bend the arm, so that the artery may be easily distinguished from the nerve and vein.

By neglecting this, I have seen the radial nerve included with the humeral artery at the bend of the arm. On another occasion I found the ligature hanging from the axilla around the ulnar nerve. Death followed in the first instance; great distress and contraction of the arm in the second.

Tie the wounded artery above and below the wound.

The rule is absolute, as the lawyers say. But how slowly have we come to this conclusion! The cases are numerous which exhibit the disastrous consequences of this neglect. I had a conversation with Mr Abernethy in 1826 on this question. You find the rule in his Lectures, p. 203, with a case of wound of the ulnar artery.

When you have done your duty in securing the artery of a limb, lay it out free from all compress and roller, and above the level of the body; use light dressing, and keep it moist with spirits and water.

Read a case in Mr Abernethy's Lecture, p. 206. I have seen a very small artery on the back of the hand, opened in using the lancet to an abscess, bleed profusely and repeatedly, a hæmorrhagic action having been induced. It

is to prevent this that the antiphlogistic practice must be employed.

The success of an operation upon the main artery of a limb will be in proportion to the lesser degree of tumefaction and œdema induced. Much dissection and too free fingering, by bringing on inflammation and tumefaction, will diminish the free action of the collateral arteries, and cause mortification. See *Aneurism.*

CHAPTER IX.

OF GUNSHOT WOUNDS.*

THE peculiarity of gunshot wounds lies in the velocity of the projectile; and it must be immediately apparent, that there is something at present which

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* I wish my reader to understand, that, on this subject, I have some title to have an opinion, having sacrificed much to obtain ocular demonstration of facts. Even before the battle of Waterloo, I had ascertained what were the prevailing rules of practice both in the army and navy; nor had I failed of my duty to object to some of them. When among the wounded at Brussels, June 1815, being very busy, Mr Hennen importuned me to go to his apartment. In this he did a good-natured thing, for it was with the obvious purpose of shewing me a thin volume, in conspicuous position, which he said was his manual, and by which he had arranged his wounded! This was my *Appendix.*

I could (distinguishing the discipline, economy, and health of armies, from purely military surgery), affirm, with truth and justice, the possibility of treating this subject from my own cases and observation, and without reference to an author of the last twenty-five years. But I shall have more regard for my reader than to vindicate myself at his expense.

You will find the old authors on army practice pointed to in Mr John Bell's works, and with suitable comments—Paré, Belloste, Ravaton, Le Dran. When we seek for principles, we must again turn once more to Mr Hunter, and then to Baron Percy, Baron Larrey, Mr Copeland Hutchinson, Mr Guthrie, Dr Hennen, and my colleague Sir George Ballingall, who, exercising his own good sense and experience, pays sufficient regard to these authorities, and may be said to embrace all their doctrines.

gives the subject importance, even in a period of peace. The extent to which machinery is carried—the length of railroads—the incalculable rapidity of motion of the beams and wheels,—give occasion to accidents where the wound partakes of the character of those which are inflicted by splinters from ship-timbers, from palisades, or stone ramparts or bomb-shells. Now, at least, it will be acknowledged that there is some resemblance between the duties of the military and the domestic surgeon!

Let us attend to the wound by musket shot.

An obtuse missile driven through the body with immeasureable velocity.

> Immeasureable? This subject has been taken up quite philosophically and pleasantly: A canon ball moves 2000 feet in a second; a 32-pound shot will pass through the bodies of seventy men; considered as sand bags, and placed like nine-pins; an ounce ball will pierce through the bodies of four men, being projected with a velocity of 1700 feet in a second. D'Antoni of the Acad. of Turin. Dr Hutton on the force of gunpowder, Philos. Transac.

Some estimate being made of the velocity of a ball, we have to consider the effect of the passing of this projectile through the body,—that it leaves a kind of conduit or pipe, the sides of which are dead by the attrition or friction of the passing body.

Let us consider this more particularly; and for this purpose lay a shilling on the paper and run your pen round it—make another circle exterior to the first, and a third exterior to the second. Now, the substance in the area of the inner circle must be displaced, and with the velocity aforesaid! It must be propelled into the space between the inner and second circle, and all this is dead by attrition. But

in what state is the portion between the middle and outer circle—bruised, benumbed, but not dead; it reacts slowly, and inflammation is set up.

When you look at a gunshot hole, it is black and sloughy, with a circle of livid colour round it, which is in exact correspondence with what is here stated. The condition of the parts in the outer circle pervades the whole tube of the wound.

Hence there is little or no bleeding. There can be no union in the wound; it must slough; the inflammation comes on slowly; and as the action penetrates the limb, the swelling must be general and great.

In the early stage the wound is small, the counter opening large. In the after stage, the counter wound is contracted, and the place where the ball entered is widened by ulceration. This is applicable on the same principle, that where the attrition is greatest the wound is slowest in the ulcerative process.

You can introduce your finger into a shot hole, even into that made by a French musket, which is smaller in the bore than a British musket. And that you can do this, you will find to be an important circumstance in the study of gunshot fracture.—See *Compound Fracture.*

These facts give rise to some reflections. A ball at rest does no harm, or very little, unless it interfere with the motion of a part. It is not to be cut out at the expense of deep and large incisions. It is so little poisonous that a sac will form round it, and it will remain stationary for years.

A ball being deep seated, (for example, about the loins), remains with little inconvenience to the patient; but a ball under the skin causes immediate inflammation, and, if not cut out, will soon make its way by suppuration and abscess.

Since the *character* of gunshot wounds arises from

the velocity of the ball, it must have less of that character the deeper it goes; and if it makes its exit, the counter opening will have less slough, and be more inclined to heal.

Again, as the *character* depends on two circumstances, the obtuseness of the body, as well as its velocity, it will happen that, when a ball is flattened against a bone, and then cuts its way out, the counter opening may heal by the first intention.

In a few days a gunshot wound begins to weep, and then the sloughy cellular membrane protrudes from it; but, for the reasons stated, it exhibits the largest portion of slough where the ball has entered.

This slough chokes up the wound and confines the matter.

We may sometimes ascertain that a ball has passed superficially, from the quantity of slough that hangs from the orifice.

If a ball has passed plump into a cavity (for example, the abdomen), there will be little slough; but if it has taken a course round under the skin, the quantity of cellular membrane deadened will occasion a large protrusion of slough. (The sketches in the Museum of the College of Surgeons were taken from patients to illustrate this.)

We shall sometimes discover the course which a ball has taken from the blush, a streak of redness in the integuments over the track of the ball.

By these views we learn the *rationale* of some rules of practice. It was supposed, from the blackness around the orifice of the wound, and from the serious consequences of gunshot, that the ball was poisoned, or that the lead had a poisonous quality.

Hence arose the practice of scarifying gunshot wounds. But the necessity of opening the wound freely in modern

surgery ought not to be confounded with the ignorant scarification of the wound.

A musket-ball making a muscular wound, as across the shoulder, or hip, or back of the thigh, or of the arm, requires neither scarifying nor opening with the bistoury.

Simple treatment, and the application of a cataplasm, is all that is necessary.

But a wound from a ball taking a course under the fascia, where it is strong and unyielding, becomes complicated; the whole limb swelling in the course of the wound distends the fascia, and thus the natural binding of the limb is as hurtful as if the surgeon had applied a tight roller to an inflamed limb. The fascia must be largely opened.

Let us now consider the effect of a ball which has struck a bone. It is possible that the lead is no longer of the round form; it may be flattened.

It sometimes is so flattened as exactly to resemble half a musket or pistol ball; and from this circumstance duelists have been accused of cutting their ball in two!

On striking the skull obliquely, it is quite flattened, and then runs under the scalp extensively, of which I have many examples in my Case-book.

When a ball has shattered a bone and passed through, it is no longer a ball, but an irregular piece of lead.

I have picked out balls thus cast into irregular and fantastic figures by breaking a bone. You perceive how the practitioner may be deceived in thinking to extract a ball, when it has become a flat or irregular shaped piece of lead. (Case of the French privateersman.)

The ball, however, keeps its form while it retains its velocity. It will pass through the hardest bone

without losing its globular form. It is by being weakened or retarded in its course that it takes an irregular shape.

A ball may be lodged deep in a bone.

The example in General D——'s case, College of Surgeons.

But it more generally passes the firm bone, and is lodged under the ligament and periosteum beyond.

Just in the manner that a ball will pass through the body or the thigh and be found in the pantaloons; or passing through the muscular substance, it will be found just under the skin in the opposite point.

From the form and velocity of the ball, oblique resistance has a singular effect in sending it in an unexpected direction, and often making it circle round the body, when you would have thought it must have penetrated the cavity.

In striking the rib, or even the fascia of the abdominal muscle, it is sent off to the integument obliquely; the elastic integument repels it with an increased obliquity of direction, and it takes a course in the cellular substance; so as sometimes to make the half circle of the body, and rest at a point opposite to where it entered.

So will a ball make most unexpected range about the shoulder or pelvis.

An old patient came into my room, and putting my hand on the left side of his belly, What is that? says he, thinking to puzzle me. It was a pistol ball, which lay in the sheath of the rectus, and all inflammation having subsided, it was as distinct as if it lay in his waistcoat pocket. He had returned from the West Indies, and boasted of having hit his antagonist in the forehead, which, he added, by miscalculation of its hardness, did him no harm! These were two desperate duellists, and both instances are illustrative; in one, the ball striking above the ileum of the right side,

had got within the external oblique, and so round into the sheath of the rectus; in the other, it had been flattened on the os frontis, and run under the integument.

A ball will not only run far between the skull and integument, but between the skull and dura mater.

I found a soldier with a shot in the forehead. I passed a bougie in its course under the os frontis; trepanned, and took it out a hand-breadth from where it entered, and the man recovered.

It does not always happen thus. I was called to a gentleman who had put a pistol to his temple. He sat up in bed chattering continually, a frightful figure, the integuments of his head swollen so as to close his eyes, and of every colour from lake to black. I found brain upon the pillow! On putting my finger into the shot hole, I felt it round and jagged. Concluding that, since the ball had pierced the skull and dura mater, it would meet with no resistance until it traversed to the opposite side, I cut down on the opposite temple, and finding there the bone beat up, I trepanned, and took out the ball. I need not say this person was mad. When inflammation was set up he became comatose, and died on the third day.

A musket-ball may enter a cavity, and course round the interior, a circumstance which is explicable on the same principle.

An instance is mentioned by Sir George Ballingall, in which the ball entered the thorax, and stuck in the inner surface of the sternum. *Outline of Lectures*, p. 228.

A ball will sometimes seem to drop into the cavity of the thorax. I attended a Colonel of the Russian service, where the ball appeared to roll about! (I recommended perfect rest whilst the ball was in a gravitating position, in the hope that it would be covered with lymph, and fix.) So have I found a ball lying in the bladder.

In cutting for a ball, consider its course as the man stood in receiving the shot, which will very pro-

bably give you a more correct estimate of its relation to the artery and nerves.

I remember standing by a very excellent physician (a man of great merit and enthusiasm in his profession, but not educated to anatomy in the manner I have recommended in the Introduction). He cut down upon a ball which lay on the inside of the arm. Now I had taken the man's case, and studied the position of the ball. This man received the shot whilst stooping forwards firing his musket. The ball entered and crossed the wrist of the left side, entered again on the fore part of the arm, and passing through the biceps, it was flattened against the humerus, and so had got under the brachial artery and radial nerve. Wherefore, as the Doctor cut deep, and began to be uneasy at the depth, I said to him, You are cutting directly on the main artery: on which he good-naturedly said, "I believe you know best;" and put the knife into my hand. I enlarged the incision, and drew a mass of ragged lead from under the artery and nerve, in the direction in which it had entered.

The nerves will sometimes indicate the course or position of a ball.

I might have said in the last case, that by the numbness in the course of the radial nerve, on pressing against the ball, I had informed myself, that although it lay apparently superficially, the nerve ran over it. So when a ball has taken its course through the pelvis, or across the shoulder, the defect of feeling in the extremity, being studied anatomically, will inform you of its course; that it has cut, or is pressing on a certain trunk of nerve.

In a bad gunshot wound, when there is doubt about the propriety of amputation, if the nerve be cut across it may be considered as determining the case, since even when such limbs are saved they are useless. I have been requested to take off the arm years after such a wound, from its being a mere encumbrance.

The period of danger from bleeding is when the

weeping secretion begins to push off the slough: and when the ball has been impelled upon a great artery, our anxiety must be great, lest fatal hæmorrhage should occur; yet, on the other hand, it is surprising what escapes the artery makes.

> I have seen the wound imply that the femoral artery must be divided, and yet nothing occurred to countenance the belief. Sir George Scott received a grape-shot, which passed under the clavicle, and in a direction which, had it been a sword-thrust, must have cut across the subclavian artery; yet all was safe.
>
> The elasticity of the coats of the artery, and the toughness of the sheath, is, I must presume, the cause of the great vessels escaping; they yield to the impulse.

It would appear that a ball passing across the trunk of an artery, causes so much injury that the blood coagulates, and there is no immediate fatal hæmorrhage. Understand me that this *may* happen; but in general the artery so cut across is *attended with immediate and fatal hæmorrhage.*

But it would appear (and here I trust to Mr Guthrie's narrative), that the great artery of a limb may be divided, and the gangrene shew itself on the *third day.*

> One may reason on such an occurrence in this manner: the ball passing across the artery, or so near as effectually to injure it, stops the circulation in that vessel; but there is nothing in *this stage* of a gunshot wound to injure the circulation in the collateral vessels; therefore the circulation goes on: But when the limb becomes tumid, from the deep extensive inflammation attending the living second stage of gunshot wound, then mortification shews itself, commencing in the lower part of the limb.

When, therefore, mortification takes place consequent on a wound, in which you trace the ball to

have gone against the main artery, amputation is the only resource, and it should be done early.

Yon will distinguish the mortification consequent on defect of circulation, from that which comes from a constitutional cause. Still the contact of the dead and living part cannot long exist in this traumatic gangrene, without communicating a taint to the constitutional powers; which is the reason that you cannot wait after the case is declared.

(This subject may be considered as continued under *Compound and Gunshot Fractures.*)

Splinters and the fragments of shells tear the flesh; and they have more or less of the characters of lacerated wound or of the gunshot wound, according to their velocity. Their sharpness may open the flesh with very little contusion or attrition, and there will be the natural attendant hæmorrhage; in which case, after securing the bleeding orifice, the flesh may be put down as in amputation.

Lagrange shot (understanding by this those broken masses of iron which are sometimes used), as well as splinters, stick so between the bones, and have been driven with such force, that the whole limb receives the shock, and mortification follows.

Cannon balls or round shot, as they are termed, take life by the concussion. And more or less of this general injury upon the nervous system attends the destruction of limbs, as well as when the injury is near the head or on the body. The momentum of the shot will be given to the part which stops its course, and the more in proportion to the opposition. Thus the thigh being carried off is mortal, when the arm being so shot away the man survives.

I have made seven sketches of men without arms from

among those which I took from the field of Waterloo, but I never saw a living man with his thigh carried off.

There has been much waste of words on the subject of the *windage* of a ball. The effect is to be attributed to the oblique direction of a spent shot.

I have seen the flesh of the pectoralis muscle torn quite away. What, then, should have been the state of the parts beneath, on the suppositions of those who maintain the opinion, that the air is so compressed by the ball as to become capable of bruising the integument, or breaking a bone? What, again, would be the state of the chest in those cases in which the arm is taken off by the shoulder?

When a limb is carried off by round-shot, it leaves the remaining part in a mangled state. From the principles on which we have proceeded so far, it will be manifest that the integuments, by yielding, may escape, while the bone is shattered. So at least it happens, that the loose skin overhangs the muscles and shattered the bone when the arm is carried away; and so also it happens that the bone is shattered above where the muscles are divided.

If this wound be left, it goes through a painful process of sloughing and suppuration, during which the patient sinks to an extreme degree of feebleness and nervousness. Some seven or eight days after the affair, you find the flaps of skin swollen in irregular masses; and though they may then be brought together by proper dressing, yet if assistance should be at hand during or after the engagement, it is better to save the patient from this condition by making a regular amputation.

But there arises another question—is not this regular amputation too much of a shock, when the un-

fortunate patient is reduced by the wound and loss of blood? and no doubt it is: which has inclined me, in the case of lacerated wounds by machinery, to carve out a stump from the lacerated integuments, rather than perform the operation of amputation regularly.

Of Comotion from Severe Wounds.

That severe wounds, and consequently severe gunshot wounds, are attended with nervous depression in an extraordinary degree, there can be no doubt. We must not be persuaded out of our senses! I cannot do better than quote from my friend Mr Travers.

> "A fine lad received the charge of a musket, consisting of slugs, in the thigh. The femur was shattered; there was no external hæmorrhage, but the pulse could not be felt at the wrist. His countenance was pallid; the surface cold; the pupils dilated. He was rational when roused, but strongly disposed to stupor. He made no complaint of pain, but only of insatiable thirst. Cordials were given, and hot cloths applied to the pit of his stomach. He died, with only an increase of stupor, at the expiration of nine hours."—*Travers*, vol. i. p. 111.
>
> A young family were sitting round a mortar, preparing fulminating powder. It was their father's business to make this powder. It exploded, and one was killed on the spot—another was brought into the hospital and died—a third had his leg amputated. These lads were in the condition above described. Here, probably, the shock was general to the body; but I have seen the same condition of mind and bodily frame from the legs being crushed.
>
> Sir Astley Cooper gives similar testimony of a man whose knee was crushed; the patient pale, cold, and pulseless, but without loss of consciousness, died comatose, and within a few hours of his admission into the hospital.

There can be no doubt of this fact; and upon this the question arises—what is the period for amputation?

See, in continuation, Wounds of the Head—of the Thorax—of the Belly. See Compound and Gunshot Fracture.

In surveying this department, we must acknowledge its importance and extent. We see that there is a peculiarity, but no mystery, in the wounds by gunshot. The fracture requires a knowledge of principles, and a perfect acquaintance with anatomy. When balls are to be extracted—when let alone—when amputation is to be performed—and whether on the field or after delay; these are most difficult questions; but they are, after all, questions which, if the surgeon cannot determine, he is as unfit for domestic practice as for the field or the cockpit.

CHAPTER X.

OF TETANUS.*

One of the most alarming consequences of wounds is tetanus. This consists of violent and permanent contractions of the voluntary muscles, and consequent tension and rigidity.

Trismus or locked-jaw is a lesser degree of the affection. *Opisthotonos* is the utmost violence of the disease, when the body is bent back, to such an extent sometimes that he rolls insensible, resting on the head and heels. Other distinctions are drawn from the class of muscles brought into action. The subject is necessarily divided into *traumatic, acute, chronic or mild.*

What produces these terrible symptoms we hardly know. In the West Indies, and in warm climates, it is produced in an idiopathic form from exposure to the night air, especially during sleep; and most probably by exhalations from the ground. Further, we know nothing of the nature of this complaint.

It will arise from lacerated wounds, and the exposure of tendinous parts; it will be produced by bruised nerves; but it will also be produced by a slight abrasion of the skin, or a puncture. It will come on at the period of the cicatrization, rather than in the violence of inflammation. A kindly suppurating wound is least allied to it; and such a condition of the wound we often desire as most likely to put a stop to its violence.

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* Read an Essay by Dr Maclagan. The subject is treated methodically by Sir George Ballingall.

As the cases have presented themselves to me, my attention has not been called to premonitory symptoms, though such might have been observed: dejection, and an anxious countenance, mark the commencement of the attack. The patient feels a stiffness and rigidity of the muscles of the jaw; the tongue is affected. This rigidity extends to the abdominal muscles, with a pain striking inwards, as if the diaphragm were affected. The spasms become more universal, the more powerful muscles constraining the less.

I have known the transverse tendons of the rectus abdominis torn across by the violent spasmodic actions of the muscles of the back!

In the acute form of the disease, as it has presented to me, on the evening of the third day the spasms relax—he speaks more easily—he swallows—and you think him greatly improved, after which he sinks rapidly!

I fear it has been only in the milder form of the disease that authors have boasted of success.

The dressing has been the Peruvian balsam with laudanum; the solution of the lunar caustic; the warm cataplasm: And the general remedies, the warm bath and opium, and extensive fomentation with tobacco to the spine and stomach. Under such treatment the patient has recovered; leaving the impression, however, on my mind, that I had to do only with the milder form of the disease.

They have been deficient in opportunities, or bad observers, who would confound tetanus and hydrophobia.

CHAPTER XI.

OF ULCERS.

An ulcer is an open secreting sore, substituted for the natural integument and cuticle. It arises from abrasion of the surface when the health is not perfect—from some cutaneous foulness, as a boil or pustule.

Any wound or abscess may become an ulcer; *i. e.* an open sore not tending to reunion, but partaking of some constitutional derangement.

When an ulcer rises without injury or abrasion, it is from a pustule or tubercle, or some form of cutaneous disease; that is, a small cutaneous abscess discharges, and instead of filling up and healing, its sides are everted, and become a secreting sore.

Ulcers are divided into common and specific; but this betrays imperfection. Ulcers are common enough, but the term has no meaning. By specific is meant scrofulous, carcinomatous, or syphilitic sores.

We have here to do with that ulcer which is unattended with any specific or definable disease of constitution, but which certainly depends on deranged health or imperfect circulation.

You may rest assured, that when a sore is spontaneously formed on the upper part of the body, or on the outside of the thigh, the hip, or ham, it has a constitutional origin.

When a sore forms on the leg, and is obstinate, it may be constitutional, but very often it results from an imperfection of the circulation belonging to a depending part.

Structure of an Ulcer.

An ulcer is attended with an absorption of the adipose membrane beneath and around it. Its edge is elevated by deposit of coagulable lymph, and these together make the sore appear deeper than it is actually. Its surface is covered with a film of coagulable lymph, and in this the changes are wrought which we have to notice. In this lymph the granulations are formed.

The *granulations* are those small red convex bodies which appear on the surface of the ulcer. They secrete, and cover themselves with pus.

> You may see the granulations forming on the inflamed surface of a bone. You perceive on one day a matter on the surface like pale jelly, which you might wipe off; on the morrow it is fixed, and when you touch it it bleeds!
>
> These granulations have no contractile power: though such an idea has arisen from the rapidity of their growth and decay.

The granulations are healthy or otherwise, *i. e.* according as they tend or not to the restoration of the natural surface.

> When unhealthy, they are soft, spongy, and rise above the level; or they are pale, flat, and deficient in vigour.

They partake of the nature of the action from which the ulcer arose—healthy, morbid, or specific.

It is of importance to notice the *welt* around the ulcer, for while it continues the ulcer will not heal. It has been described as a circumvallation which the ulcer throws up for defence: the idea is absurd, but it leads to a useful inference, that you must cause the absorption of this hard circle, or it will be in vain to attempt healing the sore.

Although the constitutional treatment of ulcer be the most important object, yet there are circumstances to be noticed which mislead you to consider that sore as constitutional or even malignant which is not so. This is the

Motion of the Part.

This must have your particular attention in treating ulcers.

Thus a sore on the tongue will be occasioned and kept up by motion against a rugged tooth. Thus an ulcer of the lip will continue, get hard, and look angry, and yet be occasioned by a chop, irritated by continual motion. So will a sore in the groin be kept up, long after specific action has ceased, by friction in walking; and in the same way an ulcer on the ankle will be unmanageable, until the motion of the foot on the leg be stopped by the application of splints, &c.

When there is no such local source of irritation, and an open sore refuses to heal under proper local treatment, general remedies must be employed.

In a book of Surgery, I should not fill my pages with an imperfect view of the practice of Medicine; which has been too much the custom. I repeat, if we are to have one sole prescription, let it be the blue pill and the bitter draught! But a better education must have taught you to inquire from what source the health has been deranged.

Is it a pursy rich old gentleman with a running sore?—a pale mechanic?—a bloated drayman?—a young woman irregular, pale, and with swelled ankles?—Has your patient been abroad, and is he suffering from the sequelæ of formidable tropical diseases?—Is he scorbutic, with hæmorrhage, faintness, coldness, and numbness?

Another question arises—Is the sore to be healed in all cases?

Suppose that you have repelled a herpetic eruption and sores, and the patient is taken with distressing asthmatic symptoms,—you could not be easy—you would be induced to make a pustular eruption; perhaps with a weak lotion of corrosive sublimate: or to use the tartar emetic ointment.

When large ulcers are healing very rapidly, you must prevent the occurrence of other serious evils.

Mr Lawrence has said, that when in these circumstances full diet was allowed, apoplexy and palsy have followed the healing of the ulcer.

Old ulcers on the legs will not heal without blisters to the inside of the thigh above the knee. This sufficiently declares the relation.

It is on the occasion of constitutional ulcers that you have to take the advice offered, page 88. Attend to all the signs of modified disease.

General Treatment.

It is not unnatural, seeing an extensive sore, a secreting surface, to order animal diet, wine, and porter. But this is generally wrong, and very often an inflammatory action supports the ulcer, and is in truth the cause. It is oftener necessary to reduce the diet, and perhaps to purge, or even to take blood.

We have had patients brought into the hospital with spreading sores, in whom there has been every appearance of exhaustion in the haggard countenance; and yet without leeches around the sores, or general bleeding, we could not arrest the rapid progress of the ulceration and sloughing.

The infusion of gentian, with senna and cardamom in a draught, with three grains of the blue pill, was Mr Abernethy's prescription for many a day during the height of his practice.

Five grains of the *Pil. hydrarg.* for three successive nights, followed with a warm purgative on the fourth morning, gives activity to the secretions, and unloads the canal. You may find it necessary to purge by small doses of emetic tartar: a grain of the emetic tartar in twelve ounces of water, and taken in spoonfuls, at regular intervals, until it purges or vomits, and let a cordial with an opiate succeed to this.

The appetite may be restored by a draught before dinner of infusion of gentian and of cloves (caryoph. arom.), with tincture of orange peel and spirit. ammon. aromat.

On an out-patient day in the hospital, you have young women with sore legs, pale, sluggish, and chlorotic; to such you give, combined with a warm purgative, the pil. ferri cum aloe, or Griffith's mixture, or carbonate of iron with valerian. A young woman of sedentary habits, having erythema and anasarca, her legs chequered with patches and streaks of red or purple,—after urging the bowels, join diuretics to bark, keep the legs up, and cover them with spirituous lotion.

To a bloated elderly man you administer an occasional warm purgative draught, with bitters and cordials, and the compound colocynth pill, with the addition of the blue pill at night.

In either sex attend to the breathing and the action of the kidneys, especially as the cure advances;

and if there be paucity of urine, give the squill pill with mercury.

When a poor creature is out of health from damp lodging and bad food, do not give bark, but good nourishment—fresh vegetables and white wine.

In the scrofulous ulcer, you may begin with bark and soda, or iodine. In the irritable ulcer cicuta and calomel.

With children, and as an alterative, one-fourth of a grain of calomel with chalk, or the *pulv. hydrarg cum cretâ*, with an occasional mild laxative; or, suspending any preparations of mercury, substitute small doses of ipecacuanha.

Ulcers of the Legs.

You will learn nothing from Home on Ulcers; he left the subject very imperfect, the dressing being wholly neglected. This led to the Essays of Baynton and Whately: They left out the treatment of the constitution, on which account London surgeons were indebted to Mr Abernethy: But he, on the other hand, was indifferent to the proper surgery or dressing of wounds and ulcers.

You must advance to this subject by considering the peculiarities of the circulation in the lower extremities,—the effect of position and motion,—the cause of varicose veins, and their effect.

The circulation of the lower extremities being imperfect or weak, an accidental abrasion, a gnat bite, a mere scratch, becomes a sore.

You will know when the sore arises from this defect of circulation, and consequent diminution of vigour of constitution of the part, from the state of the veins round the ulcer, and from the dark colour of the granulations, when the patient stands.

An old ulcer will be known by its callous edges, and the dark venous vascularity around it.

When the sore is deep and foul, with an abrupt sharp edge, you may look for a constitutional cause.

We are inattentive to the *lex non scripta* of the profession. Sensible practitioners were at all times aware of the necessity of bandaging the sore leg. But before Baynton and Whately the treatment was not followed on principle, and therefore often negligently performed. A principal object in all dressing of ulcers of the leg is, to restore the vigour of the circulation by supporting the vessels.

In the dresser's box there should be certain articles, which he may require in his rounds. For example :—

Rollers—strapping—sheet-lead—caustic—blue-stone, or sulphate of copper—tincture of myrrh or of benzoin, or balsam of Peru—ceratum plumbi cum cretâ—ungt. resinæ flavæ—with red precipitate of mercury.

As to the first, learn to handle a roller neatly, taking care to turn it so as to correspond with the form of the limb; and remember that the main object is to give a gentle and uniform pressure to the whole limb.

The strapping of adhesive plaster is another mode of supporting the veins and pressing down the welt. These slips are laid obliquely across, beginning below, and laying them over each other, in the form of the 18-tailed bandage. Lead I was wont to prefer;—the thin sheet-lead, polished and clean, and laid on the ulcer, and extending over the parts around, and supported by the adhesive slips or the roller.

With regard to these stimulating applications, it is remarkable that an ulcer does not heal permanently unless a good constitution is given to the granulations. The tinctures are used when the granulations are pale and flabby.

When an ulcer is irritable, and anodyne fomentation and cataplasm have been used in vain, the balsam will often be found to agree, and destroy the morbid irritability.

The ceratum plumbi cum cretâ is the proper dressing to the healing margin, and to the parts healed; while the ungt. resinæ flavæ is a proper dressing to the centre of the sore.

The caustic is applied to the surrounding welt, which is then poulticed; this is when it is very callous.

A wash with the solution of the argentum nitratum will excite to the formation of cuticle; and a lotion of the oxide of zinc will promote the healing of the excoriations and superficial ulcerations. The oxide of zinc ʒi. to ℥iii. of rose water. Shake the phial, for it is not a solution; dab it on, and let it dry.

Such are the uses of the contents of the dresser's box. Some ulcers require more particular attention.

When an ulcer is very foul and sloughy, whilst you attend to the health, foment for half an hour, morning and evening, with decoction of chamomile and poppies, and in the interval apply a poultice, enjoining rest.

If it be sloughy and indolent, add muriate of ammonia to the decoction. If irritable, use extract. conii in the poultice, or powder of conium. If very offensive, use the carrot poultice, to which you may add some powdered charcoal.

When the circulation has become excited, and the discharge promoted, relaxing applications must be disused, and the stimulating treatment substituted.

When the sore is offensive, with deep sloughs, and surrounded with dark erysipelas, put pledgets of lint which have been dipped in camphorated oil into the chasm, and cover all with the fomenting poultice. Endeavour to draw off dark offensive stools, and then give bark and wine.

The irritable ulcer you will know by its not bearing the dressings. The edges are sharp and jagged. It has a whitish spongy bottom, with an ichorous discharge.

For such an ulcer it has been common to give the cicuta pill. The local applications are,—the poultice with cicuta and opium, or the poultice of carbon and powdered opium. But these failing, as I have said, use the balsams. The dry irritable ulcer was first treated by Kirkland with balsam of Peru, and the effect was such as even to cure trismus.

The Indolent ulcer may be thus described: the surrounding skin is thick and prominent, the edge as if cut sharp and sodden; the circle within has no regular granulation, it has a dull red fibrous appearance. In addition to what has been recommended, the nitrous acid and water is used as a lotion.

Ulcera Verminosa.

It is the season, and the peculiar smell of certain ulcers, which attract the flies.

Decoctions of bitter herbs, such as of wormwood and rue, are used; or solution of corrosive sublimate over the dressings. There is an old powder of aloes, myrrh, and nitre, recommended in "foul wormy ulcers." Attention to defend the parts will prevent the necessity of such things.

Hospital Ulcer or Gangrene.—"Pourriture des Hôpitaux."

There are shocking histories under this head, which you would do well to read, in order to learn what neglect and bad atmosphere and crowded wards will produce. You may read of it in the history of the Hôtel Dieu, in Mr J. Bell's work, Sir Gilbert Blane's Diseases of Seamen, Dr Trotter's Medicina Nautica, Dr Rollo on Diabetes, Dr Thomson on Inflammation. The latest authors are, Drs Boggie,

Blackadder, and Hennen, and Mr Copeland Hutchinson. As it has appeared to me, it is a bad erysipelatous inflammation, in which the ulcers run rapidly to mortification and sloughing, and is to be attributed to that undefined condition of the atmosphere when the wards are crowded in hot seasons.

Your attention is arrested by seeing the patient pale, sallow, low-spirited, and with a heavy eye. On turning off the dressings, there is visible a dark bloody spot upon the granulations, and next day a foul cineritious slough covers the bottom of the sore. "A sore of the size of your hand becomes in twenty-four hours as large as the crown of your hat."

Some of our most sensible writers treat of the hospital gangrene and sloughing phagedena as the same disease.

Mr Lawrence has described a phagedenic sore of the nates and vulva in young women living in a state of prostitution—not venereal.

He makes it out to be consequent on their miserable lives—cold, poorly clothed, irregularly fed, and seeking relief in intoxication. The state of the system reduced by small-pox brings on a similar condition. The cure is by mopping the sloughy surface with the nitrous acid.

The Scorbutic Ulcer.

Let me at least make you aware of such an ulcer, although we see little of it. We see an approach to it in patients brought into hospitals from low damp cellars; for the disease arises from confined air, damp, distress and inactivity, and bad food and deficiency of nourishment.

When in excess, the character of the constitution is shewn in spongy bleeding gums, livid blotches and

wheals on the skin, œdematous legs, and a bloated countenance. This is attended with lassitude, laborious breathing, and syncope.

The wound discharges fœtid matter, with blood; often coagula cover the surface, below which the surface is soft and spongy, and a bloody fungus shoots out.

The treatment consists in proper food, with fruit, white wine, cider or spruce. The applications, lint dipped in strong decoction of bark, with the carrot poultice.

CHAPTER XII.

DISEASES OF BONE, INTRODUCTORY TO FRACTURE.

Inflammation of Bone.

THE bones are subject to many diseases; they inflame from causes constitutional, as well as from external injuries. Inflammation in them is attended with a pain—dull, aching, and deep; arising slowly, and excruciating at last. In them inflammation gives rise to ulceration and caries; to abscess; to nodes; exostosis, and tumour; to exfoliation and necrosis.

The subject is, therefore, of great extent and interest. It requires weeks at lecture to discuss it: it requires demonstration of natural and diseased specimens in order to be intelligible. A written volume would leave the reader uninformed. Here, therefore, I restrict myself to practical remarks.

In inflammation of a bone, you consider from what constitutional cause it arises, and treat it accordingly. Is the pain in the coverings? In the fascia, and rheumatic? Is it an affection of the bone itself, and syphilitic? Does it arise in a scrofulous constitution, threatening the various consequences of that condition.

I do not object to the term *Periostitis*. But I believe it to be a mistake to describe the periosteum as the seat of a disease distinct from the affection of the bone itself. There

are reasons, and many analogies, to shew why the superficially seated bones are most subject to inflammation.

Inflammation—in a long bone, for example—is to be treated on general principles: local bleeding and fomentation; leeches and blisters; and incisions through the periosteum: whilst calomel and opium and antimony combined, and colchicum, are the medical remedies. The division of the integuments and periosteum over the inflamed bone in many cases gives immediate and permanent relief.

On the same principle that you would open an abscess under a fascia, you require to trephine the bone when pus has formed in the centre.

Read what Sir Benjamin Brodie has published on abscess in the tibia, *Med. Chir. Trans.*

Much has been written to little purpose on caries.

Because they do not define what is meant. A surgeon puts his probe into an ulcer, and he finds that he can force it into the bone, and he says "The bone is carious." What is this? A bone softened by inflammation, where the earth has been in part absorbed. Or, again, in probing, he feels the bone rough: "The bone is carious." In this latter case the bone is dead, deprived consequently of its coverings and periosteum—it is exfoliating. Or suppose that there is an ulcer on the leg which extends to the bone: "The bone is carious." Thus is caries any thing or nothing. The bone may participate in any disease, modified by the peculiarity of its composition, in possessing the hardening material, earth of bone.

Having understood the nature of bone, you readily conceive that it is subject to all manner of disease, either originating in it, or communicated by the approximation of diseased structure to it.

A bone, consisting of membrane, cartilage, and phosphate of lime, being deranged by morbid action, will exhibit some

of its original properties, and become perhaps a *fibro-cartilaginous tumour*. Again, the marrow of the bone being of the nature of the fat, is subject to the same disease,—*osteo-steatoma*. The tumour, originally seated in the centre, gradually expands the shell, and bursting through it, feels soft and elastic. The surgeon mistakes it for a tumour of the soft parts, and attempts extirpation, until, carrying his scalpel deep, he strikes on the hard base of bone.

In *osteo-steatoma*, *osteo-sarcoma*, *fungoid tumour*,[1] difficult questions occur.[2]

[1] The same with medullary sarcoma of bone.

[2] Tumours originating in the bone require amputation, if we except cystic tumours, which may be treated. But when the tumour is malignant, amputation will not save the life. You cannot promise success. For example, in the fungoid or medullary tumour, the constitution may have partaken of the disease. You inquire into the state of the glands, of the extremity, and of the state of the viscera, before you propose amputation; and too often, when giving the patient the chance of prolonged life by the operation, you find the disease shewing itself in the stump.

Before a disease of a bone has arisen so as to be an external tumour, it has propagated itself internally along the cancelli. In amputating therefore, unless in the mildest chronic tumour, we should go above the joint into which the diseased bone enters.

Exfoliation is the death and separation of a portion. It may be external or internal. The process may take place so as to separate the whole thickness, the extremity, or process of the bone. But the term *Necrosis*, though it means the death of the bone, is appropriated to a very peculiar effect of inflammation.

The surface of a bone being injured, a thin layer only will be thrown off, like a leaf of bone, hence the term exfoliation; but it is in all cases the same process, an absorption of the living bone excited by the contact of the dead part.

Necrosis may take place in any person when inflammation and suppuration affect the interior of the living bones; in compound fracture improperly treated, and in gunshot fracture.

It takes place spontaneously in young people of a strumous habit. The thigh or leg inflames: fever accompanies this condition of the skin; abscess follows; the matter makes an exit, and there is a period of relief. Again, fever is ushered in by shivering; the limb swells up; it is firm in all its length; there is a new abscess and a new opening; and now a portion of bone comes away, which declares the deep source of the complaint. After many successive attacks, and long open sores, there comes away a large portion of bone, which on examination proves to be the whole shaft of the bone!

In a bad stump, after amputation, the matter getting access to the centre of the bone, it inflames: new bone is formed round the old shaft; and after a tedious time, and much suffering, the shaft is withdrawn, and then happily the stump heals.

This is very much of the nature of our experiments; for by opening the bone of an animal or fowl, and introducing a foreign body into it, necrosis is produced. Read Dr W. Hunter's First Cases, Med. Obser. and Enquiries.

The curious circumstance in this case is, that often the patient is walking about whilst the process is going on. The explanation of this is, first, that the cause is limited to the shaft of the bone; secondly, that the shell of new bone is formed by the inflammation of the old bone: and on the death of the old bone, the new one is capable of bearing the weight, and is united to the extremities of the old bone where they constitute the joints.

The most singular part of the process is the ulceration of the new shell, opening a passage for the wasted portion of the old shaft, viz. the *sequestrum*.

An important question arises in those cases of spontaneous necrosis, for example, of the tibia—What ought to be done, and when should the operation be attempted?

The operation is this: the surgeon is prepared with trephines, saws, chisels, and forceps and bone-pliers. He makes an incision down to the bone, laying it largely bare. He then trephines it, so as to open a passage for the sequestrum. This probably requires to be done a second time, and the saw is used to divide the intervening bone. Then the sequestrum is drawn out.

But too often I have seen it occur, that after these incisions and perforations have been made, with protracted suffering to the patient, the bone has been too firm to be brought away. This must be gravely considered by the surgeon, and he ought to be sure that the old bone is separated and lies loose in the shell before he operates; and let him remember that he is only completing a process which Nature will accomplish without his aid, if time can be afforded. See *Gunshot Fracture*.

There is no reasoning on the subject of *necrosis* unless we go to the elements of anatomy, in which very few are properly initiated; or unless you make the experiments which I did in my early professional studies.

Fragility of the Bone.

I am not assured that there is any such morbid condition of bone, except what arises from want of use and old age. When an old feeble lady, who has long kept her bed, trips on the carpet and falls on her haunch, the top of the thigh-bone is shattered like a piece of china.

Bone must be exercised as well as muscle to be preserved perfect. There is always in the natural body a due correspondence between the active and resisting forces.

When, on questioning a patient on the nature of the accident, you find that the force, on calculation,

was not equal to the effect, as when a man stumbles from hitting his toe in going up stairs, and breaks his thigh-bone! you must think of the possibility of there being mollities ossium in the case.

Mollities, malacosteon.—In that case there would be pains universally in the bones, with earthy deposit from the urine. The disease proceeds, I am afraid, unchecked by remedies. The disease is very slow in its progress, which therefore makes the observation of the effect of remedies difficult. Though attended with important consequences in the female, the disease is by no means peculiar to her. See the case of Thomson, Med. Obs. and Enquiries, for the ultimate effect of the disease. See also the Catalogue of the Museum of the College of Surgeons for what I have observed.

Rickets is a very different disease from mollities ossium. It is scrofula in one of its hundred shapes, and the most distressing.[1] The bones become soft, and yield to pressure; yet, as to our present purpose, it is singular that, easily as the bones break, they notwithstanding readily unite.[2]

[1] Rickets is a disease of childhood. It is preceded by unhealthy evacuations, a tumid belly, an enlarged liver, a sickly and pale countenance, and flabbiness of flesh. Then comes a peculiar form of head, enlarged extremities of bones, and distortion, first taking place near the ankles, then in the spine, and finally affecting every bone. See some curious and important observations by Mr Shaw.

[2] I had a patient in the Middlesex Hospital who suffered fourteen fractures in succession. All of them united.

CHAPTER XIII.

FRACTURES.

Short Review of what is to be attended to in Fractures of the Bones.

This important practical division must be prefaced with much general discussion, on the structure, growth, diseases, of the bones—of the pathology of fracture, reunion, &c. There opens to the student a very interesting part of physiology, and a no less important part of pathology. These preliminary studies may then be summed up as in this section.

The *student* has become acquainted with the structure and vascularity of bone—the cavities, shaft, and epiphysis—the impropriety of the term *callus*—the process of formation and of the reunion of bone, and the formal distinctions in fracture.

It is as well to know the distinctions which authors have made of Fractures:—

1. Transverse.
2. Oblique—split longitudinally.
3. Double fracture.
4. Complicated—*e. g.* extending into a joint, or when an artery is wounded.
5. Comminuted—bruised into small fragments.
6. Compound fracture.
7. Gunshot fracture.

These admit of remarks at lecture which are here unnecessary.

As a *practitioner*, these are lessons which he must

retain. The reunion of bone is a process of health. Your study must be to preserve the health, and to keep the parts in contact.

In all cases learn how the accident has occurred before you examine the limb: the nature of the violence and the direction of the force teach you what to expect. On examining the injured limb you are expected to declare an opinion, and inquiries *then* have the appearance of doubt and hesitation. Be careful in carrying the patient.

If the patient must be carried home, let care be taken that the ends of the broken bone are not pushed past each other, to the effect of tearing the soft parts, and perhaps opening an artery. Lay pillows on each side of the limb, and sticks along these, bracing them with cords. If a sheet is used, it is slipped under the wounded man, and then fastened to polls; these are lifted in the fashion of a sedan chair. This carries him securely, but the sheet is apt to bag, and let him fall low, by which the limb is shortened, and the bones crushed together.

When you lay out a limb to secure it during the night, or whilst the imprudent patient is drunk, it is common to do it with junks. Junks are nothing more than bundles of straw rolled up in a sheet. Fold the sheet so that its breadth shall equal the length of the limb; put bundles of straw on the ends, and roll them up till they nearly meet; place the leg between them, and tie the whole together with three distinct portions of roller. You double each piece of bandage, and lay it under the junks and limb; pass one of the ends through the loop, and then tie the ends together.

Crepitus is, the grating of the broken extremities. If the surgeon does not feel the crepitus, this may be owing to the ends passing each other. Let him extend the limb, press the bones together, and ro-

tate. Let him be careful to distinguish the sensation arising from an inflamed joint and the defect of synovia, from crepitus.

Setting the Limb.—This is a foolish term, but the prejudices of society cannot be despised. Do not bandage the limb before the swelling has come on. The most serious consequences result from this imprudence;[1] and yet, if the limb be simply laid out with a cold lotion, the minds of relations are irritated with expectation.

[1] Very early in life I picked up a poor lad in the street of Edinburgh who had fallen from a window. I carried him to the Infirmary. On visiting him next day I found they had bound up his broken arm with splints and roller. The hand was swollen: vesications were on the skin. The mischief was done in a night: the arm mortified and dropped off by the elbow. Notwithstanding my advice and constant precautions, in twenty-two years' attendance on a great hospital, I have witnessed the same imprudence many times attended with mortification and death.

An assistant extends and smooths the limb. Soap plasters are put on each side (not around) where the splints are to be placed; they give a gentle support, and prevent chafing: soaked lint is laid so as to make the contour of the limb correspond with the straight splint.[1] The splints are placed on each side, and tied with the tapes or looped roller.[2]

[1] The common splint is formed by glueing leather and thin lath together, and then splitting the laths, so that they lie easily round the limb; but they do not correspond with the form of the limb in the direction of its length. A straight splint cannot be made to touch and press equally (for example, the knee, the calf of the leg, and the ankle), you therefore model up the intervals with lint wet in spirits and vinegar. The best splint in the lesser fractures is soaked

pasteboard, laid on, soft: it may be stiffened with white of egg.

[2] It may be proper to roll the whole limb; do it from below upwards; see that the limb is not bound too tight above. If the limb must be supported against œdema, I prefer distinct slips of bandage, put on like the 18-tailed bandage, so that they can be loosened or adjusted without disturbing the limb.

The limb is then laid out in the easy posture, which is that of relaxation of the muscles.

There is no good reason for delaying the reduction of the fracture; that is, the placing of the bones in their just position, and as far as possible retaining them so; always with the precaution as to bandaging.

A very wrong notion prevailed with some London surgeons, that as the bones were not fixed for some weeks, the setting of the limb was of no consequence till that period. As the process of reunion commences with the final adjustment of the bones, you are in danger of disturbing the process of formation of bone by this delay, and inducing the formation of a false joint by such an ignorant proceeding.

The important distinction in fracture is the state of the soft parts. The limb may be bruised throughout its whole substance. The injury may be such to the deep parts that the limb is a sac of coagulum. The bone may be comminuted, or finally there may be,

Compound Fracture.—Compound fracture is where the fractured bone is in communication with an outward wound of the integuments.

You must distinguish the case by the manner in which the wound has been made. The bone may

have been thrust through the integuments, the force having been in the length of the bone, and the fracture oblique. It may have been made by a cutting instrument; Or the wound may have been bruised, and the bone laid bare by a wheel or great weight.

The essential distinction is this, that when the integuments are opened, whether cut, or torn, or bruised, they inflame, and are subject to the disorder of the health. Hence suppuration; and this suppuration running deep involves the bones—the limb swells, and the fever runs to dangerous excess. In many cases it is practicable to convert the compound into the simple fracture, by procuring adhesion of the integuments. Take care, however, that in attempting this, you do not confine matter.

When a deep suppuration surrounds the broken ends of the bones, and especially if there be loose pieces, they do not live, they separate from the periosteum, and become of themselves sources of irritation and more intense inflammation. The remote consequence from this condition of the parts is necrosis.

It is in these circumstances most important to have a free exit for the matter. The wound should be opened so freely as to require no counter opening. If neglected in the beginning, counter openings are necessary. Nothing tends more to relieve the constitutional symptoms than freedom given to the matter.

In the treatment of these accidents, the long confinement must be considered, and some things anticipated. If the patient be put into a common bed, it will in time sink low, and the limb will suffer displacement. Let a hair mattress be put over the feather bed, and let the ticking be drawn tight, and supported by boards below. An adjustment may now be made, which deferred, till inflammation shall

have arisen, will give great pain; a drawing sheet may be thought of.

It may be necessary, from the violence of the injury, or the general shock, to use the lancet. But the practitioner must look forward to remote consequences, and consider the debility which will arise from long confinement, perhaps weakening suppurations.

The bowels must be discharged and preserved regular at all events, and care taken not to load the stomach. Opiates should be reserved for occasions, and not indulged in.

In fracture, towards the period of cure, it is of advantage to remove the bandages and readjust them, and to relieve the limb from them from time to time, the surgeon being present and watchful. It is of advantage also to change the posture, or to bend the neighbouring joint. Friction gently upwards relieves the œdema and assists the circulation. Attend to the parts which are pressed; defend them against inflammation and sloughing, especially the hip and heel. Bathe with salt and water, and spirits, and apply soap plasters, or a circular pad, to keep off pressure from the tender part.

When there is great injury in the case of compound fracture, or when the great joints are implicated, we have to fear, if there is great restlessness and depression, or if the pulse becomes frequent, the tongue dry, with tendency to delirium. This *delirium tremens* is too often the effect of these violent wounds.

Great caution is necessary in this case, and great decision. You would imagine it to be a case for depletion, and

the strict antiphlogistic practice, when nothing but opium and stimulants are effectual.

When the Fractured Bone remains ununited.

Think whether there be any intervening substance, and whether the bones be in contact; or whether there be any disorder in the constitution to disturb the natural action of reunion. Too great freedom of motion may cause it.

I have known dysentery, at the period of union, cause a false joint. Pregnancy does not prevent the union of bone, as was supposed. Strange to say, rickets prevailing does not delay the reunion. See p. 102.

1. Let the bones be more securely braced together, taking especial care not to apply bandages so as to impede the circulation.

2. Try Mr Hunter's plan: put on firm splints, and raise the patient and put him on crutches, and make him bear upon the leg, even though it give some pain. After this let him again be put to bed; and rest for some time strictly enjoined.

Mr Hunter's notion was, that the natural stimulus, or "stimulus to perfection," was wanting, and that the bone being put to its proper use, it would be excited to complete what was necessary to its function. We may understand the practice differently—as a mode of exciting to inflammation and the action of reunion—in the parts which had become indolent.

3. The more formidable operation is the passing a seton between the bones.

The invention of Dr Physik. He had been a pupil of Hunter.

In this operation we must not expect an immediate

effect. The seton is kept in for months, and the harbinger of success is a swelling round the ends of the bones, and consolidation, by which the fracture becomes stiff.

It succeeds in the humerus. It has succeeded in the thigh-bone, but very seldom.

4. The more violent operation of exposing the ends of the bone, and sawing them off, has been often done without success. In some rare cases it has succeeded, and in fracture of the femur and tibia in my hands it has failed.

When the bones have remained long loose, their extremities waste to a point, and then there is no remedy.

Diastasis.

One species of fracture we may dismiss in these preliminary observations. Diastasis is separation of the epiphysis from the diaphysis or shaft of the bone.

The reader must recal the knowledge of the original structure of a bone; that the ossification occurring in a distinct spot near the extremity of the cartilage, forms there a nucleus, which enlarging, becomes the articulating head of the bone; that this epiphysis is long united by cartilage to the shaft, and that this head may be twisted off.

The accident occurs in childhood, or before the fourteenth year. I have known it occur in the humerus from a boy firing a musket; in the head of the thigh-bone from a fretful child casting himself backwards whilst held in the nurse's arms. I have found it in the lower head of the femur; the leg of the boy having been caught in the spokes of the

wheel whilst he was attempting to get upon the back of a carriage.

This form of diastasis, or of fracture, wants crepitus; and being a separation near the joint, it is apt to be mistaken for dislocation. The treatment is the same as for fracture of the bones. We expect the bones to unite by callus as in common fracture.

If neglected in childhood, the lameness or deformity is great in after life.

Of Gunshot Fracture.

If you have attended to what is delivered under the head of gunshot wounds, and these observations on compound fracture, there will require little to be said under this head.

When a musket ball strikes directly and forcibly upon the shaft of one of the long bones, it breaks it into pieces.

When it strikes the more spongy extremity, it more generally sinks into it and lodges.

When the shaft is broken, a distinction may be made, whether the ball has gone off, or whether it has passed quite through the bone, scattering the lesser pieces and driving them into the flesh. It is obvious that the latter is the more severe accident.

Because there is a peculiar complication; these portions of bone make wounds which more readily inflame than that made by the track of the ball, and the tumefaction of the limb is very great and general.

I found the Russian and Prussian surgeons dilating these wounds freely with the scalpel, a practice which I had not

observed in the English army. There is no doubt in my mind that there is the most pressing necessity for such dilatation of the wound, and for the reason I have stated in *compound fracture.*

During the war, I had several officers under my observation who were suffering from necrosis, which they would have escaped had their wounds been freely enlarged at first.

In fracture of the thigh-bone, the case is fearfully complicated with the inflammation of the mass of muscles. Mr Guthrie, supported by other authorities of experience, considers the case one for amputation. The cases that I have seen, have been of the most desperate description; and, a fortnight after the wounds were received, the bone shattered, and the upper end sticking some inches from the wound. They demand amputation, and the patient in these circumstances seldom recovers.

When the ball sticks in the head of the bone, the joint becomes implicated, it anchyloses, but the patient is still subject to great exhaustion and hectic. If the wound closes, it opens again with new suppurations, and increase of suffering and fever. Whilst there is uncertainty as to the position of the ball, amputation may be delayed, but to this it will come at last.

I have observed the most experienced army surgeons to make no hesitation in amputating, when the patella was penetrated by a musket ball. The same may be said of a shot piercing the capsule, and passing across the knee-joint.

Read Amputation at the Shoulder-joints, on the question of treating the head of the bone struck by musket shot.

CHAPTER XIV.

FRACTURE OF THE THIGH-BONE.

Take the exemplification of these principles in *Fracture of the Thigh-bone.*

Hear all that can be said of the nature of the accident deliberately and attentively.

1. Has the force been applied to the fore-part of the thigh, as by a heavy wheel whilst the patient lay on the ground? Then the bone is simply fractured in the middle.—2. Has he fallen from a height on his feet? Being a young man, you have an oblique fracture of the shaft.—3. If an elderly person,—then in all probability the cervix is broken.—4. Is it an old woman who, stumbling, has fallen on her haunch? Then the trochanter and neck is broken, external to the capsule.

Now, turning down the bed-clothes, if you see the limb shorter, and the foot turned out, it is a fracture of the thigh-bone. To examine the nature of the fracture, you make an assistant secure the pelvis. You draw out the limb, bending the knee-joint; you rotate, when the crepitus is felt.

> Fracture may be expected in age; dislocation in youth. Fracture may be expected in woman; dislocation in man, *i. e. cæteris paribus.*

If your suspicion fall on the cervix and trochanter, you alter your position. Your assistant rotates the

limb whilst you fix the pelvis, and marking the superior spinous process of the ilium, and placing the thumb upon it, you place the fingers on the great trochanter. The trochanter major is higher and less prominent than natural. It is closer to the back of the ilium. As the rotation is made, you feel the crepitus, and you feel that the bone does not roll from under your fingers in the same manner as when, the cervix being entire, the bone moves upon the head lodged in the acetabulum. You can extend the limb, and it retracts again.

There being no crepitus felt, you make the assistant draw out or extend the limb, and then rotate.

There being still an uncertainty,[1] you make the patient stand on his feet, and pressing strongly on the trochanter, you make him raise the sound limb from the ground, when the weight falling on the cervix, if it be fractured, it will be declared.

[1] The muscles acting on the shaft push up the great trochanter, and shorten the limb. But sometimes the extremity of the shaft is so entangled, that it is not so displaced, and this mark of fracture is absent, till you make the patient stand.

Sir Astley Cooper makes three species of fracture of the neck of the thigh-bone; 1. Through the cervix; 2. At the root of the cervix and outside the capsule; 3. Through the trochanter major. The real distinction, as to the question of reunion, is simply, is it within or without the capsule?

The subject has taken a curious course. The ingenious Mr Cross of Norwich being my house pupil and diligent student, goes to Paris. There he finds them at fault in this matter, and embodies his notes of my lecture in the form of criticism. The Parisian surgeons take it up, the English rejoin, and so the matter assumes a needless degree of importance,—the question being, whether the neck of the bone does reunite. Now, certainly it does not, un-

less it be broken external to the capsule, and then there is blood extravasated, inflammation, consolidation, callus formed, and ultimately bone!

After perusing Sir A. Cooper's volume, read Mr Guthrie's observations, *Med. Chir. Trans.* vol. xiii. I have so often exhausted my breath on this subject, that I might have thought Mr G.'s Observations unnecessary.

Look also to the *Dublin Reports.*

Read a paper by Mr Stanley, *Med. Chir. Trans.* vol. xiii. on Fracture of the Trochanter Major, and its resemblance to dislocations of the head of the femur.

Consult Mr Syme's paper, *Ed. Med. Journ.* April 1826.

Above all, attend to the important series of dissections by Mr Hawship, *Med. Chir. Trans.* vol. xix. a great many old women falling and striking the trochanter.

It is a very uncommon fracture which leaves the muscles so attached to the shaft as to turn the foot inwards.

The fracture may take place low down in the thigh-bone, and extend into the knee-joint. This will happen when the patient falls on the knee or on his feet, when the outer condyle of the femur is broken off.

Treatment.—See that the patient has a mattress under him; that the canvass is well laced, and not likely to yield.

In the fracture of the shaft, the means recommended by Mr Pott are not approved of. Lay the thigh on the inclined plane, or some substitute for it. In that posture the patient will be easy.

Pay such attention as to assure the patient he is not neglected; but do not finally *set* the limb until the tumefaction has taken place.

In setting or finally adjusting the bones, see by due comparison of the limbs that the fractured one is of due length and just position. 1. Lay soap-

plaster along the outside and the inside of the thigh. 2. Roll it. 3. Place your splints along, one from the trochanter to the head of the fibula; a shorter one on the inside: brace these together with the looped bandage. 4. Lay the limb on the inclined plane. 5. Guard the heel; pad up carefully behind the knee; and above all watch that there does not arise œdema of the lower limb from the bandage or the gravitation of the limb.

I put twelve specimens of fractured thigh-bone into a case. All of them exhibited the upper portion of the bone projecting forwards beyond the lower portion. (The *reason is obvious. See Amputation of the Thigh.*) It is very difficult to hold down and restrain this upper portion; much easier to raise the lower to it; therefore the inclined plane is to be preferred, because it does this without the necessity of restraint.

Towards the end of the month remove the splints and readjust the bandage; raise and extend the limb, and lay it slowly and carefully down, and so secure it with the long splint, which extends from the hip to the heel. Take care that the limb is not twisted (for the callus is yet soft), either by the falling outward of the foot, or by the patient changing his posture from lying on the side to lying on his back.

If the fracture extends into the joint of the knee, the case is formidable, and the surgeon gains little credit. The antiphlogistic treatment in all its severity must be employed, and means must be taken to avoid the falling in of the knee. The limb must be kept straight with a splint on the outside of the knee, and a roller above and below the knee.

In uniting, the outer condyle is apt to be attached higher

than natural, and consequently the articulating surface of the thigh-bone is oblique, and the joint yields inward. This strains the inner lateral ligament, and produces a state of this joint weak and subject to be sprained and inflamed.

Towards the end, the knee-joint must be gently moved from time to time, to prevent anchylosis.

In fracture of the cervix, lay the thigh on the inclined plane: lay compresses on the trochanter, and swathe the pelvis, so as to bear gently on the trochanter.

Do not expect a union by bone unless the neck of the bone be split. But as there is ever during life an uncertainty as to the actual condition of the parts, treat your patient as if union were expected.

The accident proves fatal to very old people.

If the trochanter be broken off, employ a broad web of canvass, drawing with buckles round the pelvis, so as to bear upon firm compresses placed on the side of the prominent bone; and to extend the limb, and support it against falling outward, the long splint may be employed.

Fracture of the Patella.

Your patient tells you he is convinced that his knee never touched the ground; that he slipped, and was recovering himself.

On inspecting the knee, it is flat; the patella is broken across; the two parts are asunder; and the condyles of the thigh-bone being exposed, there are four prominences, which produce the peculiar flatness.

Observe, above all things, the difference of the case when the patella is broken by a blow, (*e. g.* the

kick of a horse), or by the person falling and hitting the knee, as I have known in a coachman thrown from the box, and falling with his knee on the bolt.

Mr Trotter's coachman fell thus, and broke the patella; he was brought to the hospital, when there was a new house-surgeon. There were three cases of broken patella in the house, bandaged according to rule; he did the like with this unfortunate man—inflammation, and abscess, and fever, was the consequence, and death.

In the former case you may bandage early, there being little inflammation: the bandage is destruction in the latter case.

In the case of fracture by a blow, the extravasation of blood, the inflammation and condensation of parts, gives rise to union by bone. When the patella is broken across the convexity of the trochlea by the mere action of muscles, you must not expect union by bone, *although you are to attempt it;* at all events, the closer the fragments of bone are, the better. But take care that you do not, by the awkward application of the bandage, twist round the fragments, so as to present an unequal surface towards the joint.

Treatment.—In the common case, place the patient so as to relax the quadriceps muscle; raise the body so as to bring the pelvis forward, and extend the leg; put no firmer bandage about the knee than you can make with a neckcloth; wait to see that no great inflammation or tumefaction arise.

When satisfied of this, apply the proper apparatus.

Mr Lonsdale contrived a very effectual instrument. It is a circular steel ring, padded, and with a cushion; on this cushion a screw operates, so as to fix it just above the upper fragment of the patella. The circular ring and cushion are then drawn down by straps to a circular which goes

round below the knee. I gave him several patients on whom to apply this apparatus, and the cures were very good; even giving hopes of union by bone.

When this instrument is not at hand, a pad and roller is put round the thigh above the retracted portion; a roller is also put round below the knee; straps are then slipped under these, so that they lie parallel to the ligament of the patella: these being tied and drawn, bring down the upper fragment towards the lower. But trust most to the position of the body and limbs.

For a long time the patient should wear a support and knee-cap, lest a slip should break the knee-pan again.

I have known the integuments torn along with the ligamentous union, and the joint laid open by a transverse wound.

It is not unfrequent to find a patient with both patellæ broken! Is it that the weakness of one limb, and consequent stumbling, causes the second accident?

Fracture of the Bones of the Leg.

Care must be taken to prevent the extremities of the fractured portions from pressing through the skin.[1] Lay the limb on the side, the foot extended, and the knee bent; or lay it on the inclined plane long since invented by Dr Aitkin, a surgeon and lecturer of Edinburgh. Towards the end of the cure, and when the callus has united the bones, the patient may be relieved by laying the limb in an extended position. Sometimes this position suits from the beginning, preventing the upper portion of bone from being thrust out against the integuments.[2] In

all cases guard against the foot gravitating outwards.[3]

[1] The muscles of the leg being posterior to the bones, they, in their contraction, force forward the fractured ends. The upper portion will be found to project.

[2] When the leg is placed in this position, protect the heel by placing it in a *nest*.

[3] Compare the position of the foot with that of the knee, and see that the splint supports the outside of the foot.

Compound Fracture of the Tibia.

When the tibia is broken, and the end thrust through the integuments, it is difficult to reduce the bone. Free incisions being good of themselves in compound fracture, rather open the skin and fascia than saw the bone.

When a portion of the tibia is taken off with the saw, the fibula keeps the ends of the bones apart, and a false joint is formed. It is better, therefore, to save the bone if possible, and to make free with the integuments.

In reducing the bone, do not draw so as to extend the leg in one line from the knee to the heel; but keeping the upper part firm, incline the lower a little obliquely backwards. This relaxes the muscles behind the bone. You may then introduce the lever between the extremities of the broken bone, and bring the leg into the straight line.

When a sharp spicula of bone projects from a compound fracture, it should be notched with the saw, and nipped across with the bone forceps.

If the ends of the bones be found in their place, or if they are easily reduced, you may attempt to heal the integuments. By this the case is reduced to a simple fracture. But if a suppuration has taken place, then open both the integuments and fascia.

Fracture of the Head of the Tibia extending into the Joint.

In this case the straight position of the limb is to be preferred. The danger is from high inflammation of the knee-joint. Anchylosis is to be apprehended.

*Fracture of the Fibula.**

Hear the account of the accident: the person has missed a step—or his foot has gone into a hole—or he has attempted to drop from a height, *i. e.* the force has fallen perpendicular, and the inner ankle yielding, the weight has come upon the fibula.

It is generally broken about two inches from its lower head.

Placing the thumb upon the part, it yields and declares the fracture. But the fracture may be ascertained otherwise, if on moving the foot, rotating it, and turning it outwards, there is pain, not in the joint, but two or three inches upwards. Again, if on pressing the fibula towards the tibia at a point removed, there be pain, then the bone is fractured.

Examine the inner ankle, and see whether the deltoid ligament be torn or sprained.

"Only the small bone of the leg broken, that is all!" but for your own credit explain that the chief injury is at the ankle, and that long after the bone is knit there will be weakness there. Better break two bones than sprain one ligament.

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* The common term *Potts' fracture* directs you to a good practical book, the works of Mr Pott.

There may be a partial dislocation of the bones of the leg from the astragalus. The reduction is difficult.

The bones slip forwards, the heel projects, and the instep is shortened.

There may be compound dislocation of the ankle and fracture of the fibula.[1] Lay the leg on the outside on the proper splint, pad up the inequalities with lint dipped in spirits and water, taking care not to press on the ends of the bone. Look to the position of the foot, in regard to the knee-joint, and preserve the great toe in a line with the patella.[2]

[1] In compound dislocation of the ankle, the important question is, How has it been done? A wheel passing over the ankle and opening the joint, is a case for amputation. On the contrary, if a young man, leaping from a carriage, suffers a compound dislocation of the ankle, the foot may be saved.

Further, to shew the resources of Nature, the astragalus has been taken away, and the foot saved. In these cases all will depend on the age and constitution of the patient.

[2] See Dislocations.

The *lower end of the tibia* is sometimes fractured within the ankle-joint, or the *malleolus internus* broken off. The foot is inclined inwards, and the crepitus distinct. The soaked pasteboard splint should be applied on the inside of the ankle, the long splint and foot-piece on the outside. Every attention must be paid to prevent inflammation rising in the joint.

When the inflammation has subsided, the position of the foot must be accurately surveyed; and it may be necessary to place the leg in the inclined fracture-box, padded behind, and resting on the heel. The sole of the foot is braced to a splint, and this is adjusted with tapes pinned to the mattress.

FRACTURES OF THE UPPER EXTREMITIES.

Fracture of the Clavicle.

This is the most frequent accident of the kind. Being unattended with any serious consequence, the patient is unruly, and hence deformity.

If you find the shoulder discoloured, or at least hurt; a hundred to one, the man has pitched upon his shoulder.

When the shoulder is discoloured by a blow, you may expect fracture; when there is pain and lameness, without direct injury, you may expect dislocation.

You find the acromial portion of the clavicle depressed, and the shoulder low. The sternal portion is supported, and perhaps a little elevated, by the action of the sterno-cleido mastoideus.

The action of the pectoralis and latissimus assist in depressing the shoulder, and drawing it towards the body. Set the patient propped with his back towards you, and you will perceive the depression.

There is an apparatus which effectually serves the purpose of setting this bone. That not being at hand, proceed, 1. To elevate the depressed acromial portion; 2. To counteract the riding of the fractured extremities.

Placing soft cushions in the axilla, lay the double-headed roller across the back, and bring it round under the arm-pits. Then form the figure 8 behind, so as to brace back the shoulders; a pad[1] being placed

high between the arm and side. The roller is next used to raise the elbow and keep it to the side.[2]

[1] Perhaps the term pad may be wrong, since, if it be thrust into the arm-pit (where it acts as a fulcrum, the humerus as a lever), it may produce numbness by compressing the nerves and bloodvessels. But if a long compress, rolled up on the edges, be placed between the arm and side, it must extend the shoulder outwards, which is the object desired.

[2] Do not disgrace yourself by placing a compress on the fractured extremities. If you put a plaster there, it must be for keeping off the patient's fingers, who, by touching and pressing, inflames the skin over the sharp bone.

Fracture of the Acromion.

The man has pitched upon the shoulder, or a weight has fallen on the joint of the shoulder; he feels as if the arm had suddenly become heavier. Distinguish between this accident and dislocation of the acromion from the clavicle: distinguish it also from dislocation of the humerus.[1] Feel for the spine of the scapula; feel along to the point of the shoulder, there the bone sinks; push up the humerus into the joint and the bone is raised; and thus you are made sensible of the crepitus.[2]

[1] It happens sometimes that the acromion is broken, and the end of the clavicle dislocated. The accident is rare, and very troublesome. See dislocation of the clavicle.

[2] Or raise the elbow from the side, and rotate. The connection of the deltoid produces crepitus.

You use the spica bandage, and you apply a handkerchief or roller so as to raise the elbow. This is for the purpose of raising the fractured portion by means of the head of the humerus.

If the ligamentous covering of the bone is not sufficient to keep the fragment in contact, and the middle portion of the deltoid muscle pulls upon it, it will be necessary to lay the patient in bed, and to have the arm removed from the side, so as to relax the deltoid.[1] If he must be moving about, a pillow should be put between the elbow and the side,[2] which will have the effect of relaxing the deltoid muscle.

[1] If the acromion should unite in a depressed position, it would prevent the humerus from being elevated, and limit the motions of the joint. Unless attention be paid during the cure, the fragment will unite by ligament only.

[2] If you push the pillow too far up into the axilla, you will push off the fragment from its proper connections.

Fracture of the Body of the Scapula.

For example, the lower angle being broken off, it is drawn forwards by the serratus magnus. It cannot be restrained; therefore, by managing the position of the arm, you contrive that the scapula shall be made to follow the fragment.

Generally you place the centre of the palm on the nipple of the opposite side, and bandage the arm in that position.

Fracture of the Neck of the Scapula.

You will be apt to mistake this accident for the more common one of dislocation, owing to the head of the humerus falling off from the acromion.

You distinguish it by the greater mobility of the parts, and by the crepitus on rolling the arm whilst you grasp the shoulder.

In setting it, pad up the axilla, and support the elbow; use the spica bandage.

Fracture of the Humerus.

It is the most simple of all when fractured in the middle.

When fractured at the neck, you may mistake it for dislocation.

The united action of the pectoral muscle and latissimus dorsi draw the end of the humerus into the axilla.

Placing the fingers in the axilla, and pressing the elbow to the side, the fractured end will be brought into contact, and crepitus felt.

Extend or pull down the elbow; lay on the splints, one extending on the outside to the shoulder, the other on the inside, and up to the axilla. After securing them, place a long narrow cushion between the arm and the side, and bend the arm to the side. The elbow may hang; the support being a sling round the neck, supporting the wrist.

But let the important distinction be noticed—it is the powerful deltoid muscle which retracts the lower portion of bone when the humerus is fractured above the insertion of that muscle. The powerful action of the muscle may make it necessary to relax it, by confining the patient to bed, in order that the arm may be removed from the side. This position effectually relaxes the muscle.

Fracture through the Trochlea and across the Fossa.

Take care to distinguish this accident from dislocation of the ulna and radius backwards. The ease with which the parts may be extended and reduced to

form will enable you to distinguish it. When the arm is thus extended, crepitus will be felt.

The best splints are formed of moulded pasteboard. Begin early to move the joint, or you will have anchylosis.

Oblique Fracture through the Fossa and into the Elbow Joint.

By falling on the projection of the elbow, the olecranon communicating the shock breaks off the condyle, and splits up the trochlea.

See that, in setting it, you prevent obliquity in the position of the bones; which would twist the fore-arm, and produce deformity and weakness.

Bend the joint early with care, else you will have anchylosis.

This is an unlucky case for a young practitioner. The inflammation runs high; and stiffness of the joint and deformity is likely to be the result.

Fracture of the Bones of the Fore-arm.

Of the Olecranon.—It takes place by falling and striking the elbow on the pavement, as when one holding something precious in the hand is desirous of saving it. The prominence is gone, a soft swelling is in its place, and the finger sinks into the joint. The tendon of the triceps has drawn up the fragment. You can move it with ease laterally, but without relaxing the muscle you cannot pull it down. There can therefore be no crepitus.

Although the process be here broken off by the external

injury, yet practically the analogy with the case of fractured patella is complete. The fragment does not unite with the bone by bone, but by ligament.

The object to be kept in view is to place the surfaces in contact. By extending the arm too much you displace the fragment, and perhaps place it awry. If you bend the arm too much, you separate the fragment and exceedingly weaken the joint, subjecting it to frequent sprains.

Cut a narrow roller, laying a slip on each side of the olecranon; place an oblong compress over them, and a little higher than the fractured portion. These, as well as the roller, should be wet. Support them with two or three turns of the roller. Cut it off, and stretching the slips, roll also below the joint; then bring the ends of the slips down, draw and fix them, so that they at once secure the olecranon from a lateral shift and draw it down. Place a compress on the fore part of the joint and a splint, and roll over all; and this is done to keep the arm moderately extended.

The meaning of placing the compress under the splint is to let the elbow-joint be bent in a very slight degree.

Begin early to move the joint, just so much as to prevent consolidation.

If the shaft of the ulna be broken, it will be by the force acting directly upon it. This fracture is to be treated on the general principles.

Fracture of the Radius.

This is a very common occurrence; for, when a person falls forwards on the palms of his hands, the shock comes upon the radius alone, and often the ulna escapes.

If you observe the defect which follows this accident, it will suggest the proper practice. Two flat splints are used; the inner one extending along the palm of the hand.

If the ulnar edge of the hand be too much raised, as it will necessarily be by a straight splint coming along the under side of the fore-arm, the hand will be raised, the extreme end of the radius pressed, and the fractured extremities depressed (assisted by the action of the quadratus). The result of this is anchylosis of the two bones, and more certainly an awkward position of the hand. Again, if the hand be permitted to turn into the prone position, the lower broken end rolls away from the upper portion; and being fixed thus, the rotating motions of pronation and supination are lost; for the extreme portion of the radius is in pronation, and the nearer portion in supination; and in this position they are fixed.

This is the reason why the hand is permitted to drop so as to counteract the action of the *pronator quadratus.*

When all is right in the setting, the patient may counteract every thing by placing his hand in a sling! If a sling is used, take care that the hand hangs free of it.

Fracture of the Radius near the Wrist.

This is very common. The bone snaps close to the edge of the *pronator quadratus.*

It is often mistaken for sprain and partial dislocation. A wrong position of the hand, and permanent weakness of the wrist, is the consequence. It requires two firm straight splints, well braced together.

Let it be remembered that this fracture is often combined with dislocation of the head of the ulna.

Fracture of the Bones of the Hand.

These are easily distinguished, with the exception of fractures of the further ends of the metacarpal bones, which in their symptoms much resemble dislocation.

In treating these you may take the recommendation which has been given of using a ball, which is to be grasped, and the fingers and hand bound down over it with a roller.

FRACTURE OF THE BONES OF THE PELVIS.

If the great arch of these bones be broken, it implies great violence, and thus imminent danger of life.

Generally in workmen or miners, by the falling of a bank of earth.

When the ossa pubis are broken down, the urethra may be torn. This will be indicated by blood flowing from the urethra. Try the catheter, with every possible precaution. But it will probably hitch into the rupture. If it cannot be passed, and the urine is retained, an incision should be made in the perineum towards the neck of the bladder. If the urine escape into the cellular membrane, it leaves no hopes of recovery.

It spreads wide round the broken bones, and under the peritoneum, and into the pelvis.

The *fracture of the ala ilii* is much less formidable. The position must be studied, so that the abdominal muscles do not pull off the fragment.

FRACTURE OF THE RIBS AND STERNUM.

You will remember that in fracture of the skull, spine, and ribs, the contained parts constitute the consideration of importance. Here, for example, the state of the lungs, pleura, and motions of the ribs, form the proper subject of prefatory study.

An elderly gentleman, in reaching for a book in his library, falls with his side against the corner of a table. He breathes with pain, and has pain in turning. Is it fracture of a rib, or merely a bruise of the serratus magnus?

The ribs may be broken by pressure on the chest; and then they are cracked, as when a bow is overbent. Press upon the rib anterior or posterior to the point hurt; if the rib be broken you will give pain, but not if it be only a bruise. Place your hand over the suspected part, and make the person breathe freely; if the rib be broken you will feel the crepitus.

The accident is most frequent in advanced years.

The cartilages in a young person are throughout cartilaginous and elastic; the ribs themselves in youth possess elasticity, and hence they bend, and yielding escape fracture.

In this accident you bleed, and swathe the chest, and enjoin rest; and relieve the tickling cough.

Observe, there are two good reasons for using the lancet: 1. To keep off inflammation from the membranes and lungs; 2. To reduce the circulation to such a degree that you may bandage the chest, and keep the ribs at rest. If you roll or swathe the thorax, and so stop the expansion of the chest, and throw the act of breathing altogether on the diaphragm, you make the patient suffer all the horrors of suffocation; since there is a call for full inspiration in proportion as the circulation is full.

By neglect of proper precautions very serious consequences follow this simple fracture.

I have known the fracture of three ribs, neglected, cause great mischief. An abscess formed under the pectoralis muscle; pus was also found in the chest and in the pericardium. To be sure the patient must have been strumous; but do not such patients break their ribs?

If much oppression arise, with an inability to lie down, especially when the rib has been beaten in, as by the blow of a boxer, feel for emphysema under the roller.

I do not remember to have seen the intercostal artery torn unless where there was an open wound; but it is possible. Effusion of serum into the cavity of the chest is more probable.

When emphysema occurs, the patient must be watched. Slight degrees occur frequently, and terminate well without any thing being done. But it may increase to an alarming or fatal degree.

Punctures with the lancet may be made, and the air in the exterior cellular membrane pressed towards it. But the dangerous condition is from the air pent up within the cavity of the chest; and if the patient start up from bed in fear of suffocation, and breathe with difficulty, heaving his chest with that peculiar twist of his body that indicates distention of one cavity of the chest; more than scarification must be done: an incision opposite to the fractured rib must be made, so free as to allow the air readily to escape from the chest.

As it is natural that the reader should turn to such an authority as Dupuytren, I am forced to say that his clinical lecture on the subject is a string of blunders and misconceptions.

A person will exist with extensive emphysema extending upwards to the eyelids and down to the scrotum? But the danger arises from the air distending the cavity of the chest so much as to impede the action of the diaphragm, and to press over the mediastinum, so that the opposite side is also oppressed; then the breathing becomes difficult in a dangerous degree, and the patient may die suddenly. Giving vent to the air on the wounded side relieves the whole apparatus of expiration.

Fracture of the Sternum.

The fracture of the sternum implies great violence, and is highly dangerous from the importance of the parts beneath. Whilst every means calculated to ward off inflammation is employed, and to relieve cough, which in these cases has the worst effects, by agitating the fractured portions, the case is to be treated as the fractured rib. I have had patients who recovered.

Fracture of the Jaw.

The lower jaw is broken by a fall; or by a blow, as in boxing. It may be broken in two places; being in this respect in the condition of an arch.

It is known by the displacement or inequality of the range of the teeth, by the pain and crepitus. If broken in the place of the symphysis, the muscles of sides being balanced, there is little displacement. There is more when the base is broken opposite to the canine tooth, for then the lesser division is more displaced.

An instrument has been contrived which makes a

very perfect cure. It consists of a semicircular piece, which embraces the teeth, whilst another grooved semicircular piece catches under the chin. These are united by a screw, which brings the bones to a level, and holds them firm.

If this should not be at hand, the base of the jaw and the chin are to be covered with softened pasteboard, and this afterwards covered with white of egg.

This being properly retained for a time, hardens, and makes a proper splint. The jaw, in addition, is secured by the split double-headed roller. The centre of the bandage has a slit, which admits the chin. Two of the four tails go up around the head; the two others go round the neck near the occiput.

If the teeth be imperfect, so as to produce an inequality in the jaw when bound up, the defect is supplied by thin pieces of cork interposed between the teeth.

Fracture of the Ossa Nasi.

There is great tumefaction, and consequent uncertainty as to the state of the bone. The practice is to introduce a strong probe, or other suitable instrument, and with this within, and the fingers on the outside, to raise and model up the bones. Unless this be carefully done, there is great deformity when the swelling subsides. The swelling of the surrounding soft parts preserves the bones in their place.

CHAPTER XV.

THE CONDITIONS OF THE SPINE, ITS ACCIDENTS AND DISEASES.

THE spinal column is of the highest interest to the surgeon, as it contains the most vital organ of all; and, as it is the centre of the skeleton, its condition is of the first importance. Even when not affected by disease, properly speaking, but distorted by mere debility and indolence, it affects the thorax, and consequently the breathing and the constitutional powers. The treatment of distortion, therefore, should not be left in the hands of the mere mechanic.

§ I. *The Distortion of Young Females, chiefly of the Educated Ranks of Society.*

1. We find this distortion in young women from eleven to sixteen.

After this the spine fixes, be it straight or be it distorted, and the cure is hardly practicable.

2. The mother or governess brings the young lady to you, on account of a projection of the shoulder, or perhaps because one of the mammæ is larger than the other.

I have seen the mark of leeches and of blisters to the shoulder! Sad proof of imperfect education in our profession.

3. As the patient comes into the room, her gait is awkward, and there is a projection of the left os ilii and of the hip.

4. Let her be stript, and a shawl thrown over the neck and breast; and now, looking on the back, you mark the curve of the spine: take your pen and touch the spinous processes of the vertebræ, from the vertebra prominens to the sacrum.

5. Place the cord of her stays on the spine of the vertebræ of the neck, and draw it tense to that of the sacrum. You now perceive that the dotted line takes the curve of the italic *f*; and you measure its deviation below to the left side; above, to the right side.

You hope to see the amendment marked by the diminution of the spaces between the straight and the dotted line.

The effect of this deviation from the straight line of the spine becomes apparent. In consequence of the concavity to the left side, the ribs converge; and this side of the thorax is contracted. A corresponding divergence, consequent on the convexity of the spine towards the right side, throws up the ribs. The left shoulder, therefore, lies on a diminished convexity of the chest; the right shoulder stands prominent, in consequence of the increased convexity of that side of the chest.

But as the thorax, formed of the ribs and sternum, is an entire circle, the cartilages of the ribs are squeezed out on the left side: and the breast, if the girl be of age, is more prominent.

A certain degree of distortion is so common, that it is generally said the left mamma is larger than the right.

Now, look to the lower vertebræ of the back; perhaps there you find a more acute turn, which is to be noticed, not as indicative of disease, but as a form of deviation not so easily remedied. Observe, too, that whilst the spine is thus curved in the form of the italic *f*, it is at the same time twisted. The transverse processes of the vertebræ of the loins are brought so far round, as to render prominent the long muscles on the left side of the spine.

Consequences.—If this condition of the spine be neglected, a girl whom nature intended for a fine young woman becomes an "object." She is shorter than she should be, and necessarily awkward in her movements. Often the distortion fixes in a moderate degree; being observed only in the manner in which she thrusts her shoulder forward, and in the prominence of the hip; but very often the lungs suffer compression, and the constitutional strength is undermined.

Precaution.—Distinguish this *lateral distortion* of the spine from rickets; from scrofulous caries of the vertebræ; from original malformation of the thorax; and from distortion consequent on vomica or empyema, attended with diminution of one side of the thorax.

In these last cases the spine takes a curve; not the cause but the consequence of the state of the thorax.

Cause.—This curve is attributable—1. to the time of life when the peculiarities of the female system begin to disturb the constitution; 2. to natural in-

dolence, and the confinement incident to education inconsiderately pursued.

A young person lounging indolently stands naturally on the left foot, throwing the right into a position of relaxation. The effect of this is to incline the pelvis, on which as on a basis the spine rests. The spine is projected to the left side at its lower part, and, to preserve the balance, the body is twisted to the opposite side, above.

To Correct it.—1. Attend to the constitutional indisposition. Let there be freedom of exercise. Let her dance, run, jump: but no lounging; no standing; not even sitting; but all lessons to be take whilst lying on the inclined plane.

2. Let her sleep on a firm mattress and low pillow, and change the side on which she sleeps.

3. If she rides, let the pummel of the saddle be made to turn so that she may change her seat; one day to the left, the next to the right.

4. To exercise the spine in the manner described three times a-day, and to be sponged and rubbed on the spine and loins after exercise; and to use the Indian clubs; or,

5. If the case be bad, nothing will promise a cure but the exercise and regulations connected with inclined plane.

That described in Mr Shaw's book on this subject.

6. The advantage of those exercises, friction and champooing, is remarkable in improving the state of the skin, increasing the appetite, and confirming the "constitution."

An important consideration offers itself here to

the practitioner. How does it happen that so many young ladies are laid upon the inclined plane or horizontal position, and remain so confined for many tedious months, having no disease of the spine?

Many have I known so put down for twelve or eighteen months; then come hysterical weakness, strange anomalous symptoms, paralysis, &c.; and the health at this critical period is quite destroyed.

It proceeds from the irritation on the uterine organs, attended with pain in the loins; which pain is attributable to disease of the spine. Let the practitioner study the causes of those pains—the uterus, the colon, the kidney—for all these induce distress in the loins, and distinguish these from affections of the spinal column or spinal cord.

Few conditions are more apt to deceive than the state of the spine in a hysterical girl. You touch a spinal process, and she flies up with the expression of the most exquisite pain. If this be taken for disease of bone, and be treated accordingly, by confinement in the horizontal posture, the consequences are lamentable.

§ II. *Curvature of the Spine, with Caries.**

This is the more formidable disease. It implies a scrofulous constitution, unless it has arisen from a severe accident.

No doubt a slight spasm is often the immediate cause. Thus a child throwing itself back whilst held in the nurse's

* What is Caries? Certainly it does not mean either death or rottenness of the bone here, but that scrofulous inflammation, which, together with pressure, to which the vertebræ are subject, is attended with absorption.

arms, sprains the joining of the dorsal and lumbar vertebræ, and gives occasion to a scrofulous caries, commencing in the ligaments.

I have known the disease produced in a man of sixty, from a twist of the body (being a powerful man) in throwing himself from a stumbling horse.

The disease may occur in any part of the spine; most frequently at the joining of the dorsal and lumbar vertebræ. It is most distressing and formidable when it takes place in the upper vertebræ of the neck.

Suppose that it presents in a Child.—1. See that you remember the natural appearance of a child's back, and do not run into mistakes.

Thus I have seen issues put on each side of the *vertebra prominens*, while there was no disease.

In an infant, the loins project when it is sitting on the mother's knee, just at the joining of the back and loins.

2. Do not mistake a nervous debility for that paralysis which arises from disease of the bone affecting the spinal marrow.[1] Inquire into the state of the bowels, and whether there have been green purging stools with spasm.

[1] Nothing more common in children about the period of weaning than a flaccidity of the lower extremities, or total want of muscular power. I rather wonder that Abernethy should particularise two cases.

3. The mother tells you that the child had the use of its limbs, could stand and spring up, but now the flesh is soft, feels woolly, and when she sets him upon his feet they sink under him.

4. You examine the spine, whether it be tender, whether the child twists and cries on pressing a particular part.

5. And if that part have the integuments puffed and swoln, so that the processes of the vertebræ are obscured, the disease is a commencing caries in the bodies of the vertebræ.

Treatment.—You can hardly treat a young child by medicine. Give it a few drops of the liquor potassæ in beef tea. Case its body in leather so as to prevent the motion of the inflamed vertebræ, and apply caustic on each side of the prominent part of the spine. Let the child be carried horizontally.

Let the child have the warm salt bath. Sponged with the muriate of ammonia in solution with spirits. As medicine Vinum ferri: The pulvis sodæ cum hydrargyro and rhubarb:* Infus. cort. cascarillæ with soda: As laxative, the tincture of aloes in syrup of orange peel.

The Disease in Youth.—The lad trips and falls frequently. He is ill and hectic, easily fatigued, and complains of his loins. He seeks the recumbent posture; or, in walking, leans for support; or lays hold of his knees with his hands, to take off the pressure from the spine. He is subject to spasms in the legs and thighs.

When the lower extremities are affected, he is sensible of losing power more than sensibility.

The spine is tender when touched.[1] The integuments are a little puffed. By-and-by the spines project, and declare what is taking place. Evening fever and the other symptoms of hectic prevail.[2]

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* Or, ℞ Sodæ carbonat. gr. vi.
Ferri præcip. gr. i.
Pulv. Rhei . gr. ii. Ft. pulvis ter quotidie sumend.

[1] You spread the fingers over the part, and strike upon your knuckles; the percussion reaches the inflamed spine.

[2] Sir Benjamin Brodie says: "There is scarcely any disease which presents itself under a greater number of forms." Is it not rather that many symptoms are attributed to this which arise from different causes?

When abscess anterior to the spine takes place,[1] which is a very common accompaniment of the more severe form of the disease, the anterior crural nerves may be included in the inflammation, and give rise to another train of symptoms.[2]

[1] By referring to chronic abscess, it will appear that there is anterior to the spine that condition of the cellular membrane which may be the seat of abscess, independent of disease of the bones.

[2] Pains extending down the thigh.

We have to distinguish from this disease what is vulgarly called *creeping palsy* of the lower extremities.

This disease, however, belongs to mature years. See the Nervous System, Appendix.

Treatment.—1. In these cases, it is of the utmost consequence to avoid pressure and friction of the inflamed surface of the vertebræ against each other. The body should, therefore, be incased and supported.

I earnestly recommend you to observe that this is very different from raising the body by means of collars, &c. when absorption has taken place, and when by lifting the upper portion of the spine from the lower a gap is left. In such a case we cannot expect a cure; since that can only be accomplished by anchylosis of the surface. And there is danger in the use of such an apparatus as Jones's collar, from the body being suffered to sink down suddenly; whereby the spine may be injured.

2. If the disease be advanced, and curvature has taken place, the mattress must be hollowed out to receive the projecting spine; so that the patient may be permitted to lie on the back without pressing on the inflamed parts.

There are ingenious beds contrived for this purpose, admitting the part to be dressed, and the bowels to be relieved, *e. g.* Earle's bed. But he is no surgeon who, being in the country, cannot contrive something to serve the purpose.

3. I find no reason for giving up the use of issues in this complaint.

In the use of blisters and issues, the surgeon will take care to notice whether they be producing feverish irritation; in which case they must be dispensed with.

4. Leeches to be applied on any accession of pain and fever. Stimulating fomentation or embrocation also are proper.

But in general the diathesis or condition of these patients forbids bleeding.

5. The medical treatment will embrace good diet, and great care of the evacuations; tonics, and all the means we possess of giving constitutional strength.

As, Sulph. quin. in Vinum ferri; Spongia usta with Iodin; Infus. gentianæ with tinct. columbæ and liquor potassæ; Solutio muriatis calcis.

The harbinger of success is the return of appetite; the freedom from fever; the subsidence of the puffy swelling; the returning motion of the extremities. The cure is by anchylosis.

The loss of voluntary power, we have noticed, is more obvious than the loss of sensibility. Sir B. Brodie says, the loss of sensibility is occasionally the accompaniment of the loss of motion. The reason of the motion being lost in a greater degree than sensation is, that the paralysis is

not from pressure, (for pressure would affect the whole spinal marrow equally), but from the inflammation of the bodies of the vertebræ on the anterior column of the spinal marrow.

The paralysis often precedes the curvature, and is often removed, the curvature remaining.

It is observed that, when caries in the vertebræ is produced by pressure, as in aneurism or tumour, there is no paralysis. The reason is, that there is little inflammation in these cases.

Inflammation and Ulceration in the Atlas and Vertebra Dentata.

Children are subject to this complaint. It is not unfrequently mistaken. The complaint probably begins from some violent or awkward turn of the head, owing to the greater size of the child's head and smaller neck. No apprehension of the condition of the part is entertained by the mother. But the child cries when it is raised—cries when it is laid down—cries when the head is turned from the nurse's shoulder. It is feverish and fretful.

The essential part of the treatment is the fixing of the child's head, and drawing of a seton under the occiput.

I have on these occasions contrived a collar that fills up the space between the shoulders of the child and ears, and which supports the chin and the occiput. This affords indescribable relief; for now, in whatever posture the child is placed, in the nurse's arms or on the pillow, the head is prevented from moving and jarring the diseased articulations.

Inflammation of the Spinal Nerves.

I wish to draw attention by this title—to an extraordinary degree of pain and susceptibility, which I

am willing to attribute to the inflammation of the vascular membranes of the spinal marrow, and which is to be relieved by leeching the spine, and by stimulating embrocation.

Allaying the pain by a pill of conium, hyoscyamus, and compound ipecacuanha.

Actual inflammatory pain must be distinguished from the symptoms which attend hysteria.

§ III. *Fracture and Dislocation of the Spine, and Injury of the Spinal Marrow.*

Fracture of the Spine is the most formidable injury to which we are liable, without the immediate extinction of life. It may not perhaps appear to be very useful to present melancholy examples of this truth; but the fracture of the spine, great as the injury is, still affords some hope of cure, and that hope may be increased by proper treatment. There are, besides, some vague unsettled notions which prevail on this subject, and which demand examination.

Case of Fracture of the Spine, fatal.

Sept. 12th, 1816.—*Auton*, 25 years of age, a plasterer. This young man fell from a height of forty feet, and in his descent his back struck against the corner of a stone stair about eighteen feet from the ground. When brought to the hospital, a swelling was to be felt over the lower dorsal vertebræ. On pressing the finger deep, a depression, or interval, betwixt the spinous processes could be distinguished. He complained of great pain in the part, and all over the abdomen. He breathed naturally, and was perfectly sensible: there was no defect of motion or of feeling in the lower extremities.

He was bled to sixteen ounces: twelve leeches were applied to his back; and he had a dose of the house physic.

13th. He has passed a restless night. He is in great pain; he vomits every thing he takes; the purgative mixture was rejected, and he has had no relief in his bowels. An enema ordered.

14th. He is delirious; his pulse frequent, not full; his skin hot. He passes his fæces and urine involuntarily; but there is no flaccidity of the abdominal muscles, and he has the perfect use of his limbs.

15th. This young man's condition is very threatening; his pulse is 136. He was delirious during the night, and threw himself out of bed. He is now in a state of extraordinary excitement, and although he has full motion of the limbs, yet the spine is undoubtedly broken, or crushed, and he will, I fear, die with the symptoms of the last case, and from the same cause, suppuration within the tube of the spine.

Evening. He is delirious, and like a man who is good-tempered in his cups: he talks continually, and invites the nurse to bed to him with very gay discourse. His stools and urine still pass involuntarily; pulse 130; weak.

17th. It has been necessary to tie him down in bed. He now appears dying; his breathing is very quick and laboured; his pulse hurried; his countenance is sunk, and his tongue is covered with a brown fur.

About an hour before death, a change took place from that happy delirium; and, groaning as in much pain, he fell insensible, and died.

The eleventh dorsal vertebra was fractured in its body. The spinous process of the same vertebra was crushed. The spinal marrow did not appear to have suffered mechanically, or to have been crushed. Pus thick in consistence, and of a greenish colour, lay betwixt the sheath and the spinal marrow. There was an effusion of serum betwixt the membranes of the brain.

Subluxation of the Spine.

Sarah Beddoes, 18 years old. This girl was thrown from a window two stories high; her back struck the ground.

When brought into the hospital, great tumefaction appeared opposite to the lower dorsal vertebra. One of the spinous processes was found to be crushed, and the spine, above and below, stood remarkably prominent. The lower extremities were not paralytic, nor the belly tumid, nor the bladder distended: her sufferings were confined to her back and loins. A wound was found at the bottom of the sacrum, which ran upwards, to the extent of four or five inches. It appeared to have been made by her falling on a spike or long nail.—A dozen leeches were immediately applied to the part injured, and repeated for three successive days.

It would be tedious to give the unvarying journal of this case. She was long supposed to be in the utmost danger, from the violence of the injury; for weeks she lay complaining and moaning in a pitiable state, in all which time nothing could be done but repeating the leeches, the fomentations, and poultices, which gave some relief, and administering the saline mixture of the house, with occasional laxatives and opiates.

For three months she lay on her side, with her body bent forwards and her knees drawn up. This was her posture of ease. It was then discovered that she had, in addition to her other misfortunes, syphilis. So that being treated for this, she was altogether eight months under our observation; and from her emaciation, the nature of the case could be comprehended: it was a subluxation. Diastasis, or separation of the vertebræ, had taken place, and the articulating processes stood opposed to each other, causing a gap between the spines. In time the articulating processes being absorbed, and accommodating themselves to their new position, she regained her erect posture.

Fracture of the Spine, fatal.

Thomas Wills, aged 30, admitted Sept. 24.—Being on the top of a neighbour's house, extinguishing a fire, he fell a height of two stories, and came with his back upon the pavement. No injury to the spine was to be felt, but he had lost sensation and motion in all the lower part of his

body and lower extremities. The bladder and intestines were insensible to their natural stimuli: he complained of a pain in his back, and referred it to the middle dorsal vertebra.

He remained for six days in this condition; blood was repeatedly drawn, by cupping, from the sides of the spine; his bladder was emptied by the catheter twice a day, and he had a stimulating enema thrown up at regular intervals. Liniments were rubbed on the extremities, which, however, could serve no purpose but to ease the patient's mind.

When he had been in the hospital for six days, his breathing became more affected, and he had a slight hacking cough. Emulsions, expectorants, and opiates, gave no relief. He was bled freely from the arm. The symptoms continuing, and the blood being buffy, venesection was repeated: but the relief was not lasting, nor indeed very obvious. For the pain in the side, and the difficulty of breathing, a blister was applied to the side. He had a mixture containing the mistura salina, tinctura scillæ, and æther.

About this time a consultation was held, and I was induced attentively to observe his condition. He was quite sensible and collected, the lower extremities lay without motion, and quite insensible. The belly was full, but exhibited an unusual flaccidity; the respiration was performed by the heaving of the chest; and there was a catch in his breathing, from pain running round his ribs on a line with the injury of the spine. That the spine was injured appeared, not only from these symptoms, but also from a certain degree of depression of several of the spinous processes of the vertebræ of the back.

Repeated scarifications and cupping on the injured part of the spine were ordered.

Oct. 8th. In the evening his respiration became very rapid, being sixty to the minute. Ten ounces of blood were drawn from the arm, but without relief. The fæces passed involuntarily, the respiration became slower, and he died.

Dissection.—Much coagulated blood lay over the sixth and seventh dorsal vertebræ, and the spinous processes of these vertebræ were broken, the tube of the spine was forced in upon the spinal marrow, and a sharp portion of the bone

had pierced and lay pressing upon the spinal marrow; a rib was fractured on the left side, the broken extremity of which pressed against the pleura. This side of the chest shewed marks of inflammation.*

Sudden Death from Disease of the Spine.

——— ———, about thirty years of age, was brought into the hospital on Monday the 22d July. He was found in Portland Road, fallen in a fit; and brought by strangers to the hospital. When brought in he was discovered to be quite dead: frothy blood appeared at his mouth, and it was supposed to have come from his lungs.

On examining the body nothing unusual was observed in the abdomen and head, or in the viscera of the thorax: but on turning back the lungs a tumor appeared in the posterior mediastinum, exactly resembling an aneurism of the descending aorta. On prosecuting the matter further, however, the aorta was observed running close upon the tumor, but not making part of it. On opening the sac it was found to contain a thick mass of scrofulous matter, in contact with a carious portion of the spine. On clearing the matter away, the bodies of the vertebræ were found to be eroded, and the inter-vertebral substance also destroyed in part, so that the spinal marrow was exposed.

From his sister I learned that he had that day taken a long walk into the city; that, after such walks on former occasions, he would complain of great pain in his back: that all the complaint which he had was this pain in his back, for which he had taken the advice of many doctors, but nothing had relieved him. On further question, she allowed that he was subject to a palpitation, which was sometimes very distressing. He had experienced no impediment to swallowing, notwithstanding the tumor seemed to press upon the œsophagus, and no difficulty of breathing.

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* It is important to observe, that the splinter which crushed the spinal marrow belonged to the body of the vertebra. It could not have been removed by operation.

Case of Diastasis or Subluxation of the Spine, fatal.

March 29. 1816.—*Marshal*, a coal waggoner, was brought into the hospital from Edgeware; the account given by the people, who brought him, was rather confused. They agreed that he had been riding on the fore-shaft of his cart, and, by a sudden jerk, was thrown off, and pitched on the back of his neck and shoulders. The man was somewhat intoxicated, and could not give a distinct description of what befel him. When carried into the hospital he was put upon his legs, but he could not stand; and when supported by the shoulders, he dragged his legs after him. At this time he complained of pain in his loins, but no injury was perceptible there. Between his shoulders, however, there was a degree of swelling and discoloration. Some of the people who were with him said that the wheel of the cart, which was empty, had gone over the small of his back; but after the first day he never complained of that part. Leeches were applied to the spine betwixt the shoulders, and his bowels were opened.

For nearly a week he lay without complaining of any thing, except stiffness in the back part of his neck, and up to this period he had no symptom of paralysis; on the contrary, he could throw his arms and legs about, and retain his fæces and urine, and expel them naturally.

On the 8th day he was almost instantaneously seized with convulsions over the whole body. He was relieved, in some degree, by bleeding, and continued sensible, though his jaw was locked.

His pulse, at this time, was very strong. Two hours after the first bleeding the convulsions were returning with more violence, when he was bled a second time. A few minutes after the second bleeding his lower jaw moved with great rapidity, and continued moving in an extraordinary manner for nearly five minutes, when all at once he exclaimed, with great animation, that he could speak. From the moment he began to speak he appeared to be maniacal, for his expressions had by no means the appearance of common delirium: at this juncture he clearly proved, by his exertions, that he was not paralytic, for it required two

men to hold him, and he almost sprung out of bed to be revenged on the nurse. He passed a great deal of fæces and flatus with singular force, for he evidently had the command of the sphincter, saying, at the time, with a smile, Beg pardon Dr ———, while he indeed used little ceremony. On raising him up to put on the strait waistcoat, he complained of pain in the back of his neck, but as there had been a blister on it we could not, from his description, understand whether it was the pressure on the skin, or something internal, of which he complained. In the course of an hour he was perfectly composed, so that, from the first attack of the convulsions to his being again sensible, a period elapsed of twelve hours. In the morning he had such marked typhoid symptoms that the physicians were called to him; at this time he had so far regained his senses, that he answered questions pretty distinctly, but when left to repose fell into a low delirium. On the third day after the attack of convulsions, he complained of difficulty in using his arm and two days after he had total palsy of the lower extremities; he altogether lost the feeling in them, which was the more remarkable, as at this time he regained the use of his arm. He lived for a week after this, but continued sinking, and still retaining about him much of the character of typhus fever. The day before his death he was perfectly sensible, and had recovered sensation in his legs; for he could feel the rubbing of a finger upon them. At this time, though he appeared to pass his fæces involuntarily, still he passed them with great force, and he was able to reject an enema which was given contrary to his desire.

Dissection.—The brain was examined carefully, and nothing was remarked except a little effusion between the pia mater and tunica arachnoidea. On cutting the muscles by the side of the last cervical vertebra a little pus oozed out; it was found to come from between the vertebræ. On dissecting up the muscles, there was found to be an evident loosening of the last cervical from the first dorsal vertebra. A few of the dorsal and cervical vertebræ were removed, and then it was distinctly seen that there was a considerable space between the last cervical and first dorsal verte-

bra; the intervertebral substance was completely destroyed, and an immense quantity of pus surrounded them. On the back part the pus had extended under the scapula, and on the fore-part was bounded by the œsophagus. On examining the spinal canal, the pus was found to have dropped down through the whole length of the sheath to the cauda equina.

Observations on the last Case.—Authors considering the strength of the intervertebral substance, have said, that the dislocation of the bodies of the vertebræ from each other was impossible. It is true, that commonly the body of the vertebra gives way before the ligaments yield. But here is an instance of diastasis or subluxation of the bodies of two of the vertebræ. From Hippocrates to the multitude of French authors who have touched upon this subject, dislocation has been considered in no other light formidable, than as producing pressure on the spinal marrow. But this case serves well to shew, that luxation will prove fatal, even although the spinal marrow be not bruised.

The last writer who treats of this subject, is M. Boyer. He observes, that in the violent bending forward of the spine, the ligamenta interspinalia are sometimes ruptured, but that no bad consequence results; rest restores the part. But the rupture of the ligamentum subflavum *(ligament jaune)* is followed by paraplegia and death, and without doubt, he adds, it is because the spinal marrow itself suffers distention. The foregoing case will place this matter in another light. It is the progress of inflammation to the spinal marrow, and not the pressure or

the extension of it, which makes those cases of subluxation and breach of the continuity of the tube fatal. The alternation of symptoms in this case is worthy of attention.

Dislocation of the Processus Dentatus of the Second Vertebra suddenly fatal.

A man was trundling a wheelbarrow in Goodge Street, near the Hospital; in wheeling it from the roadway upon the pavement, he felt some difficulty, and had once or twice drawn it back to give it the more powerful impetus. When at last the slight incumbrance was overcome, the barrow went suddenly from under him, and he fell with his chin upon the curb stone: he was instantly motionless, and although it was only a few yards to the hospital, when brought in, he was quite dead. Upon dissection, it was found that the tooth-like process of the second vertebra, which threads the ring of the atlas, had broken from the hold of its ligaments; and, the transverse ligament yielding, the process had crushed the medulla oblongata.

This sudden death will remind you of the different effects of an injury to the spine, as it happens to be higher or lower on the column. When the fracture is low, it is attended with loss of sensibility and motion in the lower extremities, and disorder of the bladder; when the injury is higher up, the abdomen suffers more distention; still higher, the respiration is affected; and when the fracture is above the principal origin of the phrenic nerve, the act of respiration is stopt, and death from suffocation suddenly follows.

Case of Injury of the Spine, attended with Affection of the Lower Extremities.

Fineckin aged twenty-three.—It appears that he fell down a shaft full forty feet deep: he complains of having hurt his

back. There is uneasiness and defect of action in the lower extremities. Ordered a laxative mixture, and to be repeatedly cupped by the side of the vertebræ of the loins.

About eight days after his reception into the hospital he began to complain of languor and universal pain; of sickness and debility. His pulse was quick, and his skin hot. It presently appeared that he had an attack of typhus fever, and he was sent into the physician's ward. Three weeks afterwards, I was called to him; he had recovered from his fever, but still complained of pain in his loins, or torpor of his lower extremities. I again ordered scarifications and cupping in the extent of the spine, and stimulating liniments: he was discharged relieved.

Injury of the Spinal Marrow, from a Hurt on the Spine.

A respectable tradesman, in mounting curtains to a window, fell from the steps, and struck the lower part of the spine against the corner of a table. The bruise was severe, but he got the better of it by the usual remedies, and in the usual time. It was some months after, that he began to feel a want of power over the lower extremities; indeed, the nature of this affection being a want of the full power of motion, and a defect of feeling, he did not attribute it to his former accident, the more especially as so long a time had elapsed before these symptoms appeared.

This man is about fifty: square, and stoutly formed, and of regular habits; seldom exceeding his pot of porter. His arms are so powerful that even now he can mount a ladder, drawing his more unwieldy extremities after him. He is active in mind and body, and the only apparent defect is in the exercise of the will over the lower extremities, for they have not shrunk nor lost muscular firmness.

When I first saw this man, I conceived that these symptoms might proceed from disorder of the lower part of the great intestines. From such a source of internal irritation there are very singular sensations of pain, and numbness about the hips, and stiffness and spasm of the lower extremities. I therefore gave him calomel, with occasional purges of neutral salts. But when, after a period of two years,

I was called in to consultation, and learned that outline of the case which I have delivered, I advised more moderate living, leeches to be applied along the course of the spine from time to time, and issues to be formed by caustic opposite to the lowest lumbar vertebra. I have no doubt that these means have, and will continue to prolong his life, and the enjoyment of that limited power of the lower extremities which he now possesses.

These two last cases recall to mind one of the most interesting of the kind on record, that of the Count de Lordat, in the Medical Observations and Enquiries, Vol. III. He was overturned, and had his neck twisted in the corner of his carriage; after the accident he served two campaigns, sufficient evidence of the slow progress of that paralysis, which encroached at last gradually on every bodily function. The report is very striking. He appeared stooping, emaciated, and dejected: he could still walk with the assistance of a cane in a tottering manner: his left hand and arm were much reduced, and he could hardly perform any motion with them, the saliva was continually trickling from his mouth, and he had neither the power of retaining it nor of spitting it out freely. What words he still could utter were monosyllables, and these came out after much struggle with a violent expiration, and in a low voice and indistinct articulation. In the last stage the functions were more and more oppressed, and often he was threatened with suffocation. Upon examination the membranes of the spinal marrow were found thick and tough, and the marrow itself had acquired an extraordinary degree of solidity. The symptoms of the two slighter cases of palsy, which we have here, are, I imagine, to be explained on the same principle,

viz., the injury to the soft envelope of the spinal marrow and the accession of inflammatory thickening. Such slighter injuries to the spine have produced a scrofulous tumor, which, insinuating betwixt the processes of the bone, have at last oppressed the spinal marrow.—*Med. Obser. Enq.* vol. iii. p. 160.

Review of the Cases of Fractured Spine.

It is remarkable that a subject of this magnitude should have so little attracted the attention of the profession. I do not know to what books I can direct you: for authors have treated of the subject very superficially, and we have only some occasional cases in our books.

The cases which I have noted for your observation, make it evident that in injuries of the spine the danger to be apprehended is the same with that which accompanies injury to the brain; viz. the rising of inflammation, and the suppuration within the Theca. This indicates the necessity of repeated general bleeding, or constant local bleeding while the danger continues. We also see the necessity of controlling the motions of the patient, whether at first, as in the state of inebriety; or afterwards, when delirious.

The first question which it is necessary to agitate is this: how far does the analogy hold in fracture and depression of the skull, and fracture of the spine with crushing of the spinal marrow?

I have not found a young surgeon who has entertained any doubt on this question; and some, who have just proceeded so far in their studies as to know why the depressed portion of the skull is to be ele-

vated, I have found very decided in their opinions, considering the operation as equally fit to be adopted in fracture and crushing of the spine. They confidently ask, Where is the difference? A bone is injuring the brain, and it is raised: a portion of bone is depressed upon the spinal marrow: let an incision be made and the portion of bone withdrawn!

They are encouraged in this by disquisitions in dictionaries of surgery, and by the discussions of lecturers. M. Boyer, the latest French authority on the subject, objects to the proposal only on this ground, that the indication is never sufficiently clear to authorize the operation, and our English authors object, because we might mistake concussion for fracture.

1. Now it is my belief that an incision through the skin and muscles covering the spine, and the withdrawing of a portion of the circle of bone, which surrounds the marrow, would be inevitably fatal. For it is not sufficiently observed, that the membranes of the spinal marrow are the most susceptible of inflammation and suppuration of the whole frame; not exceeded by those of the brain itself, of which they are prolongations. The cases before us afford indeed sufficient evidence on this head.

2. It further appears to me that the analogy on which this practice is proposed, is false; and that in truth there is no resemblance in the cases. When a portion of the skull is depressed, a comparatively small portion of the brain is injured by the intrusion; and were it possible to take away the part of the brain bruised by the bone, the function of the organ

would remain entire. But when a portion of bone has crushed the spinal marrow, the entire diameter of the cord is crushed; and although it be but a small portion which has suffered, the injury of that portion is sufficient to cut off all connexion betwixt the parts above and below.

3. Nay, even if it were a sharp spine of fractured bone which had run into the spinal marrow (supposing that the injury then produced were sufficient to cause palsy of the lower parts of the frame) before that sharp spine of bone could be withdrawn, the circumstances would be so aggravated by the exposure of the spinal marrow, that inflammation, suppuration, and death, would be the inevitable consequence. Instead of diminishing the danger, the unhappy fate of the patient would be accelerated.

4. These cases shew how inaccurately the diagnosis of authors have been drawn. What tyro will not readily answer, that paraplegia, and distention of the bladder and intestines, are the immediate consequences of fracture of the spine?

Yet we see here instances of fracture of the entire body of the vertebræ, without such symptoms as can inform us of the nature of the accident. And in the progress of the case we see symptoms arising, which no one has hitherto pointed out as proceeding from affection of the spinal marrow. Instead of loss of motion and feeling, you have seen the patient tossing in restless agony; an agony of mind without any definable suffering. Instead of palsy confining his lower extremities, you find him throwing himself suddenly out of bed, and at last rising in a wild delirium, which

our observations hitherto would not lead us to expect, as a consequence of that sort of injury which is for the most part attended with loss of sense and motion.

5. The dissection in those cases proves the nature of this excitement. The great injury done to the spine, to the bone, is followed by inflammation, which is rapidly propagated along the membranes of the spinal marrow; and as is the nature of these involving membranes of the nervous matter, when inflamed, suppuration rapidly follows: and in the present example we find the pus dropping out from the sheath when cut across at a part far distant from the fracture.

Hence we see the cause of the general irritation, and of the oppression or palsy which follows.

The inflammation of the spinal marrow is attended with an almost universal nervous irritation, which is presently followed by excitement of the brain; in the mean time, matter is poured out into the sheath of the spinal marrow,—either by its pressure causing palsy, or by its irritation disturbing the function of the part, so as to be attended with the same consequences. The excitement of the brain being followed by effusion, death ensues.

6. There remains a question of some moment, and on which, in discussion with my learned brethren of the profession, I have had the misfortune to disagree. A man who receives an injury of the spine recovers from the immediate effects of the accident; but at the distance of months, instead of having the full use of the lower extremities restored, he begins to drag them more and more, and at length becomes

totally palsied in the lower extremities, and languishes, and dies.

I have heard it proposed by very high professional authority, to cut down upon the spine and apply the trephine and raise the bone. This appears to me a most desperate measure.

In the first place, it is not proved that it is the bone which presses on the spinal marrow. Indeed, I am confident, that in these protracted cases, when the palsy increases slowly, it is the thickening of the membrane which encroaches on the spinal marrow; or a diseased action which proceeds gradually, more and more affecting the nervous matter itself.

It may be said, that although the pressure is produced by the thickened envelope of the spinal marrow, still it is the confinement of the bone which causes the membranes to press in upon the spinal marrow; and if, by taking away the part of the tube of bone which confines the membranes, freedom were given to them, the spinal marrow would be freed from pressure. But this is an idea too mechanical. On the other hand, I offer this view: the palsy is a consequence of the swelling of the membranes, and proceeds from inflammation; and if you cut down upon the bone, and saw it out, and expose these membranes, you will not only increase the swelling and thickening of the involving membranes, but you will most probably raise such direct inflammation and mischief, as to cut off the patient suddenly.

What, then,—are we to do nothing in these desperate circumstances? I do conceive the case to be desperate: but that does not authorize us to attempt a remedy which is not only desperate, but which will

not stand examination, and which affords to me, I confess, no hope. We are to take up the case as a scrofulous inflammation of the spine, and I am certain, that much may be done by prosecuting the cure with energy and perseverance, by local bleeding and deep issues.

These cases and observations on fracture of the spine were written many years ago, in *Hospital Reports*. The subject of injury to the spinal marrow may be followed out by reading the papers in the *Nervous System*.

CHAPTER XVI.

§ I. INJURIES OF THE HEAD.

THERE is no concealing the difficulty of assigning the right rule of practice in cases of injuries of the head.

You have first to consider the condition of the brain; secondly, the forms of the skull, and the provisions for the safety of the brain. These form the proper introductory studies; and as they connect the practice of our profession with science, and give a secure foundation for practical aphorisms, they are especially important.

There is another branch of the subject,—the peculiarities of the integuments of the head: 1*st*, As the brain is in sympathy with them; 2*dly*, As they are influenced by the condition of the digestive organs; *e. g.* being peculiarly subject to erysipelas; to a reflected influence.

Take up the most approved medical author; study the subject of idiopathic inflammation of the brain; be able to describe the symptoms; and on this foundation commence the surgical view. Now you are led to consider, *How does injury reach the brain?*

Seeing that injury to the brain is our proper and limited subject, the brain is affected in two ways:

1. By concussion, that is, the vibration, from the blow, upon its delicate texture.

2. By inflammation, death, or caries of the skull,

communicating inflammation to the membranes of the brain.

3. By fracture of the bone and its depression upon the brain.

Symptoms of Concussion.—First degree—have you not experienced it?—as when you have struck your head against a post: flashing of light, pain, confusion, sickness, paleness, fainting, with singing of the ears.

Second degree, as when a horseman is pitched upon his head, and lies as if dead; insensible; limbs relaxed; hardly breathing; pulse weak, it may be intermitting; pupils for the most part contracted. He may be bleeding from the nose or ears; but that often accompanies fracture: his extremities become cold. To a man in this condition you may make a show of acting, such as the application of harmless stimulants and friction; but you perceive that the danger you will have to obviate is from inflammation: yet till the pulse rises you dare not bleed.

Inflammation, coming on during the insensibility of concussion, is marked by increased pulse; flushing of the face; restlessness; the warmth more diffused; he feels when pinched, but still is stupid.

The injury to the brain is direct; *the symptoms immediate.* The analogies are a blow on the stomach; the concussion of a limb from machinery; a ball passing near the eye without touching it. The symptoms which follow are the effects of *reaction.*

If the case be desperate, there follows deeper oppression.

From effusion consequent on the excited state of the vessels.

If he survives, and becomes sensible, he much resembles an intoxicated person. Sometimes he has a morose expression; the countenance and eye inflamed; contracted pupil; rapid pulse; convulsive motions; cord-like tension round the temples. (See further of Fracture with Concussion.)

If he dies, the stages are,—concussion or direct vibration; reaction or inflammation; effusion and oppression.

Practice.—Bleeding (see, p. 13, 14); cold lotions to the head; clysters; sinapisms to the feet. When he can swallow, purgatives, with calomel and antimony in combination.

The more *remote effects of concussion* are,—inflammatory deposit on the membranes of the brain; adhesion; abscess. To be counteracted by occasional evacuation, antimonials, blisters, setons, and alterative courses of mercury.

Concussion with Fracture.

If you have understood the nature of concussion, you will perceive that, in a certain degree, it must accompany all severe injuries of the head, and shocks to the general frame; and that fracture of the skull implies a certain vibration or concussion communicated to the substance of the brain. The mere fissure or breaking of the solid bone would be attended with no immediate symptoms, were it not that the force which breaks the bone reaches the brain.

Sir B. Brodie says, Concussion is a rare occurrence: So Abernethy,—the symptoms of fracture of the base of the

skull resemble those of concussion. It would be very odd if they did not!

Hence you perceive the confusion in the details of authors, for want of clear principles.

§ II. CONTUSION OF THE CRANIUM.

1. *Contusion without open wound.* 2. *Contusion with open wound of the scalp.*

I said that the brain may be affected as a remote consequence of injury to the bone.

This is the case so well described by *Pott*, with whose works you must be familiar. *M. Quesnay, Mem. de l'Acad. de Chirurg.*, understood the case; so did Le Dran; but the line of practice is laid down by Pott. An opinion prevailed that the danger arose from a species of counter fissure. (See Counter Fissure, p. 158); and read the observations of Mr *John Bell*. You may go further, and find *death from a slight blow* in *Hildanus*, *Marchetti*, and *Scultetus*.

A small blow, as with a hazel stick used in cudgel playing, may irretrievably injure the bone; and its consequences are most formidable and insidious.

On the second or third week the patient feels unwell; looks ill; there is chillness (horripilatio); languor, with some degree of fever; he is hot and thirsty; on the scalp there is a flat tender swelling.

Having heard the circumstances, and examined the patient, you must use your scalpel, and make an incision down to the bone. ☞ Now you have something to observe which is to direct you,—the pericranium is separated from the skull, and a fluid is interposed. If left open, the surface of the bone dries.

Now it is possible that the surface only of the

bone is deadened: it may still granulate; or a scale may be thrown off. But whilst watching for the little red spot of organized lymph upon the surface of the bone, shiverings announce the formation of matter, the patient may be lost. In these circumstances the trephine is to be applied.

The *rationale* is this. The blow has deadened the bone, the pericranium therefore separates from it. If the outer periosteum is thus thrown off, so may the internal periosteum (viz. dura mater); and if so, there will be matter confined under it.

Observe that, in such a case, though dissection shews pus on the dura mater, adhesion of the dura mater to the pia mater, and deep abscess (vomica) in the brain, the symptoms are notwithstanding not the same as in "idiopathic inflammation" of the brain.

At first the skin is hot and the pulse quick; the face flushed; the eye languid; pain in the head, and lightness: he has shivering; he lies torpid; mutters and is restless in his sleep; gets up and wanders through the ward; is led to bed. He can be roused as from sleep; by-and-by he cannot; he has fallen into a deep comatose state, and expires.

Sometimes the inflammatory state is marked by more distinct symptoms. The fever is higher; the delirium violent before he falls torpid.

Contusion by Gunshot.

Having seen all these evil consequences from the scalp being bruised by the wadding of a pistol merely, I conceived (*à fortiori*) a ball striking the skull

must do mischief. But much experience has shewn that a musket ball may be flattened on the skull, and produce no one bad symptom. Nevertheless, in such a case, you must watch diligently and anxiously for symptoms.

The Skull injured by Contusion, and the Scalp laid down.

When this happens, the symptoms described may occur, and from the same cause. The outward sign will be the separation of the integuments from the surface of the bone, and the drying of the surface.

☞ Erysipelas, by destroying the integument, and denuding the bone (especially in an elderly person), may produce a similar train of effects.

§ III. COMPRESSION OF THE BRAIN.

It is here that the difficulty lies. In this we have the source of error, and of the discrepancies of authors. The student must approach it thus:

1. What is meant by compression of the brain? Is the brain compressible? No.

2. When the bone is intruded, or the blood extravasated, since the skull does not yield, What is the actual condition of the brain? The result of this inquiry will be, that, in proportion to the encroachment on the area of the brain-case, the blood circulating in the vessels will be diminished.

3. What is the consequence of the acceleration of the circulation through the brain? What of its re-

tardation? What is the consequence of the diminution of the activity of vessels by the compression?

By such a process of reasoning we arrive at the conclusion, that what is termed compression of the brain is a diminution of the caliber of the vessels within the cranium,—a diminution of the quantity of blood actually circulating; and the consequence, a diminution of all the cerebral functions,—insensibility, or profound sleep; an immoveable and dilated pupil; the pulse labouring; the breathing heavy and stertorous.

With general compression there may be a derangement of the brain: *e. g.* if the bone be so far depressed by external force as to "compress the brain," there must be at the same time a certain inequality of pressure. In the same way, if a vessel burst, the substance of the brain may be lacerated, and give rise to symptoms not necessarily arising from compression.

You will read that the insensibility of compression may continue an indefinite time—hours—weeks—months! If so, then are our premises and our course of reasoning altogether wrong. The explanation is in the following subdivision.

Insensibility from Irritation on the surface of the Brain.

There is a hiatus in all writers on wounds of the head. They take cognisance of no other cause of torpor than compression;[1] whereas irritation on the surface of the cerebrum will produce somnolency.

It is this state of insensibility that may continue for an indefinite time.[2]

[1] When a portion of dead bone is taken away by means of the trephine, and half a tea-spoonful of matter is evacuated; and when, in these circumstances, the patient opens his eyes, is it consistent with a just mode of reasoning to say "we have taken off pressure?"

[2] For example, the famous case under Cline, where a spine of bone no longer than the prickle of a thorn, sticking through the dura mater, caused insensibility for months. The medical student will find analogies. Similar effects from irritation on nerves.

Compression from Rupture of an Artery within the Dura Mater.

Here we have compression without concussion; and if the blood is effused in the substance without injury to the surface of the brain, the symptoms are not immediate: the patient will walk home; complain of sickness; vomit; take voluntarily to bed; and gradually there comes on deep coma.

See a case in the second volume of the Anatomy by *John Bell.* See a case by Sir B. Brodie, Med. Chir. Trans. xiv. p. 347. *M. Petit* first pointed out the importance of marking the distinction of symptoms, as arising immediately or remotely. See also Quesnay, *Mem. de l'Acad. de Chir.*

Thus observe how things are jumbled together, viz. the consequences of concussion and compression; because the first class of symptoms—the immediate effects—are very often, without interval, followed by those of compression. Observe further, that, in the brain (a part highly vascular and susceptible of action), inflammation very soon arises, and adds to the intricacy of the symptoms.

Thus a person standing by the side of a patient, and stating what he observes, convinces himself that he must be correct. But to be an observer requires a knowledge of principles, without which all is confusion.

Thus a blow on the head, which fractures and depresses the bone, produces a condition in which the symptoms of concussion, compression, and inflammation, are combined.

§ IV. FRACTURE OF THE SKULL.

You must make yourself master of the doctrine of counter fissure. It is an element in all reasoning on injuries to the skull—in all consultations.[1] Mere experience, however vaunted, and however necessary in our art, has failed to furnish correct views of practice in injuries of the skull. The subject must be studied by a process of reasoning or induction.

[1] A bell being struck, it vibrates. The motion is a necessary accompaniment of the sound. Why as obvious a motion does not result from a blow on the calvaria you have to consider; as, for example, owing to its substance, its inequality of form, its tables, &c. But if it be proved that in some cases the skull is fractured at the point opposite to that struck, if on other occasions the rent is lateral to the direction of the blow, and still remote from the point struck, there must be a cause, and one that operates uniformly, and in every case of injury; although in some manifestly, in others with a hardly perceptible effect.

Look to the skull; consider its texture and form. Is it possible to strike a part without affecting the whole? And why does it not ring like a glass at table? because the soft parts are in contact; because of its irregularities. It is exactly so; but if the soft

parts resist the vibration, must they not on that account suffer? This leads to the consideration of the effect of the vibration—1. on the brain; 2. on the membranes in adhesion with the bones.

The facts, then, are these: A child receives with comparative impunity blows and falls which destroy an old man. In reflecting upon this, it is to be recollected that the texture of the brain of age is firmer and more subject to injury by vibration; the skull, too, has lost the elasticity of infancy and youth, and the vibration from the blow is more intense.

Fracture in Childhood.

For these reasons, and others still more to the purpose, the old and experienced surgeon does not trepan a child. In a young person the skull is thin, more elastic, and much less brittle; nay, it is yielding. It is also a great deal more vascular, being in a state of growth; therefore, the vibration from the blow is less. If the bone be depressed, it is known actually to rise again after a time to the level! and if indented, even with fissure, the bone accommodates itself and lives. Besides, when you do trephine a child's skull, the bone adheres more to the dura mater, and you are in danger of injuring that membrane. If the dura mater be pierced in a child, *fungus cerebri* is very apt to rise.

Therefore, do not use the trephine to an infant, and avoid it by every means possible in youth.

In the adult the diplöe is formed. There are the two tables, the inner of which is dense and brittle.

Study the results of this; *e. g.* if the bone be fractured and depressed, the tabula vitrea forming the edge towards the brain is sharp and jagged.

Hence the pulsation of the brain, forcing up the membranes against it; they are inflamed, and ulcerate.

Again, the inner table is broken off to a greater extent than the outer one; so that the edge, shelving under the edge of the hole in the skull, the broken piece cannot be lifted out.

The trephine is therefore used. Often the bone can be raised to the level, but being deprived of pericranium on the outer surface, and shaken from the dura mater, it cannot live. Permitted to remain, it irritates and inflames the membranes. This is especially the case in old men. In children, the connection of the broken piece with the skull is often preserved, or with the dura mater, and consequently it lives. The living bone does not irritate as the dead bone does.

Distinctions in Fracture of the Skull.

We distinguish—1. *Contusion;* 2. *Puncture;* 3. *Capillary fissure;* 4. *Fissure;* 5. *Fracture;* 6. *Fracture with depression;* 7. *Gunshot Fracture.*

These present real and important distinctions. Practitioners will sometimes consider these differences as accidents of no moment. They are of moment, as indicative of the nature of the force, and the effect of it on the brain.

Of *contusion*—see what has been said.

Of *puncture*—observe, that the point of a sword or pike, or the small end of a hammer, penetrates the outer table, and breaks off a small splinter of the tabula vitrea, which penetrates to the brain.

A *capillary fissure*, apparently insignificant as an outward sign, is most formidable, because it has been caused by a blow that vibrates round the skull, and is attended with concussion, and all its formidable consequences. Often it is attended with blood under the temporal portion of the parietal bones.

Fracture with depression is a large subject.

Gunshot fracture is peculiar; inasmuch as the injury being inflicted by a body moving with great velocity, the fracture is often comminuted, and without the stellated form of fracture from a large and heavier body.

Any of all these fractures can be made on the skull of the dead subject by apportioning the instrument and the force. This shows the relation between the form or appearance of the wound, and the nature of the accident.

Bleeding from the Ears.

Blood flowing from the nose and ears is a symptom attending fracture of the skull. It may be consequent on mere concussion, a vibration which ruptures the membranes; but oftener it is a consequence of fissure across the base. The temporal bone suffering, the ear is full of blood, and in very violent shocks the serum of the surface of the brain flows through the ear!

You perceive how rupture of vessels external to the brain is symptomatic of concussion, *i. e.* not consequent but concomitant.

§ V. COUNTER FISSURE.

Surgeons puzzle themselves by not taking the few simple physical phenomena into consideration. Suppose you take a hoop; press it on one part, it bulges or is distended on the sides, and in consequence of this distention of its side, it is flattened on the point opposite to where it is pressed. Such is the momentary condition of a bell struck. If the reader will draw a circle, and over it an oval or ellipse of the same area, he will be able to mark—1. the point pressed or struck; 2. the point immediately opposite, which is flattened; and, 3. the points lateral to the force, and which are spurred out.

Now, instead of the hoop or the bell, take the culvaria. A weight falls on the sagittal suture; the temples are spurred out; the temporal angle of the parietal bone (perhaps on both sides) is broken or started, and separated from the dura mater beneath. Is there any thing more simple? Can there be any consideration more important as illustrative of the most common occurrences?

The next step of the inquiry is this: An old man falling on the carpet, or on soft ground, does not suffer fracture on the part of the skull which touches the ground, but on the point diametrically opposite. This does happen undoubtedly;[1] but why it does not oftener happen must be obvious,—the temples, *i. e.* the lateral parts of the circle, are thinner, flatter, weaker; and by their yielding the vibration is stopped, and does not reach the point opposite.

[1] The most distinct case I have met with, was where a

heavy square bucket fell upon the os frontis, a little to one side, and the fissure was on the temporal and occipital bone behind the opposite ear.

The fracture of the base of the skull is very frequent by reason of its inequalities; for though its form, like the groining of vaults, is strong to bear weight, it is not in the same degree capable of resisting vibration.

When a man falls, the vertex meeting the ground, there are two forces meeting in the base; 1. the vibration running round the skull; 2. the impingement of the spine bearing the weight of the body, and forced against the condyles of the occipital bone; hence the frequent recurrence of fractures in the base of the skull.

Blood frequent under the Angle of the Parietal Bone.

From these principles we perceive how coagula are so frequent in the temples. The common explanation is, that the meningeal artery is there—that it is ruptured—and that the force of the artery tears up the dura mater from the bone.

In some rare cases the artery is torn.[1] But it is not of size and power enough to tear up the connection between the dura mater and bone, unless the membrane has been shaken by the reverberation which tore it.[2]

[1] We find a thick coagulum and the artery torn, and the dura mater depressed from the bone, and the brain exhibiting a corresponding depression. But we find on other occasions the dura mater separated at both temples, and the blood effused from small vessels. Besides, my experiments on the dead body shew that the dura mater is separated under the angle of the parietal bone, where there can be no action of the artery to tear it up, but only the starting of the bone from the effects of the blow on the vertex or occiput.

[2] Accordingly, Abernethy had an hypothesis that the

compression of an artery excited it to extraordinary activity. There is no ground for such a belief.

We perceive how mistakes regarding the case of extravasation arise. The blood being effused in consequence of the shock running round the skull, the brain suffers from the propagation of the tremor at the same time inward. Hence are combined the symptoms of concussion with the existence of coagulum, and hence the greatest confusion of symptoms!

Hence, too, it happens that, although we use the trephine and take away the coagulum, the cause of pressure, the symptoms continue; shewing that they have been those of concussion and its consequences. And again, we perceive how it happens that patients seldom recover from great coagulum of blood under the skull; the extent of the extravasation being the mark of the severity of concussion.

Lastly, we see a reason why the rent or fissure tends to the temples.

§ VI. CASES WHICH REQUIRE THE USE OF THE TREPHINE.

1. The trephine is used (and with a large head) when, from contusion or other causes, the bone is dead, and there is matter under it.

2. It is used to relieve the pressure from coagulum between the skull and dura mater.

3. It is used to enable the surgeon to place his lever under the edge of the depressed bone.

4. It is used to enable the surgeon to withdraw

the shelving edge of the depressed bone from under the firm part of the skull.

Operation of Trephine.

The *instruments* are, a proper trepanning case; two levers; a punch as for the teeth; three trephines of different sizes, and adapted to one handle; a small saw; forceps adapted to the circle of the trephine; the lenticular; a brush; quill; flat probe.

1. Do not bruise the integuments, and in your incision consider how the flap is to lie, and the matter of suppuration to be drained off.

Many times, when all else goes right, erysipelas destroys the patient.

2. Spare the pericranium. Consider that the dura mater is probably shaken from the lower surface of the bone, and that if you scrape off the outward periosteum you deprive the bone of nourishment.

In which case the bone necessarily dies, and becomes a source of irritation. Thus the patient having escaped many dangers, has an open wound for many months during the tedious process of exfoliation of a large portion of the skull.

3. Is the circle of the trephine to be placed on the sound or the depressed bone? Authors tell you, on the former.

The subject requires some consideration. Suppose that there is a triangular portion depressed at the angle, with only a fissure at its base, which is on a level with the skull, and still firm. In this case, if you apply the trephine on the sound bone, near the angle, observe these consequences: 1. on cutting through the outer table, you come to press and jar against the depressed bone, and may force it against

the dura mater and brain; 2. having taken away the circular portion, and having introduced the lever under the depressed portion, you find that you can raise it to the level only; its shelving edge is still beneath the skull, and its diameter greater than the hole in the skull!

In these circumstances, you would require to trepan on three sides, and to make a very large gap.

These are the reasons why I advise the centre pin of the trephine to be applied on the edge of the sound bone, close to the fissure of the base of the triangular portion. The effect will be, that the depressed portion will be made loose all round, and can be drawn from under the margin of the hole into which it has been depressed.

The Saw

Is used when, in consequence of the application of the trephine or the original form of the fracture, there stands out an angle of bone. In that case, by insinuating the spatula under it, you can saw across the portion, and avoid those abrupt angles which are a necessary effect of the circular saw.

Sometimes you will perceive that, by using the saw, you loosen the fractured piece, and are enabled to remove it without using the trephine, and to the effect of making a smaller opening in the skull.

Precautions in using the Trephine.

1. Have the centre pin projecting no longer than till the circle has cut into the bone to a depth sufficient to retain it there.

I have seen a deep hole in the centre of the dura mater produced by neglecting this very obvious rule. When the centre is kept in too long it retards the operation.

2. Consider the age of the patient, and the part of the skull on which you are operating.

Would you expect two tables in a child? Would you expect the soft and bloody sawings of the meditullium in a very old man?

3. It will inevitably happen that the lower part of the circle is cut through before the upper, unless you are on your guard.

4. Withdraw the trephine from time to time, brush it, and run the flat probe round the circular cut. You will feel and distinguish the dura mater by its yielding; a sort of elasticity distinguishes it from the bone.

Common sense dictates that, as you now proceed, you press more upon the opposite part of the circle. Observe then a defect in the instrument not uncommon; the teeth of the trephine are not set, so as to cut a larger hole than the diameter of the cylindrical part of the instrument. Consequently, in cutting through a thick skull, the instrument is so exactly fitted to the hole it makes, that you cannot incline the instrument, and consequently you are forced to go directly through the bone,—thus endangering the dura mater!

5. Do not trust to the softness of the filings as indicative of diplöe, nor to the blood. In the case of contusion or death of bone, there is no blood.

6. If you operate for a diseased or contused bone, you will probably have fœtor on perforating to the diplöe. You smell to the trephine when it is withdrawn. The occurrence evinces the necessity of the operation.

7. Proceed boldly at first, gently and slowly at last; taking care to cut regularly and without injuring the dura mater, to leave the thinnest possible scale of bone before you break up the circular portion of bone.

The circular portion of bone cut by the trephine is broken up by introducing the lever first on one side, then on another, so as to unfix it, and taking two levers, one on each side, you *prize up* the portion cut. You use the *forceps* for the same purpose.

Raising the Depressed Portion.

Great injury is done by using one elevator; for by this you raise one side and depress the other, thereby injuring the dura mater. To guard against this, you endeavour to fix the edge by means of one lever, whilst you poise up with the other.

By picking off the lesser portions of fractured bone, you loosen the larger portion, and perhaps render the use of the trephine unnecessary. If, however, you think there will be finally a necessity for using the trephine, do not loosen the bone by picking away the lesser portions before you have made the perforation.

The use of the *lenticular* is to smooth the edge against which the rising dura mater presses, by introducing it under the edge of the rough bone.

Dressing.

The mildest dressing is to be used; lint dipped in

oil put in contact with the dura mater,[1] and over it layers of the same, so that the compress and roller may be applied in such a manner as to give gentle and equable compression to the whole.[2]

[1] They say, lay down the integument on the dura mater; it is the best dressing. But this can seldom be accomplished.

[2] The object of dressing is to support the dura mater, and to prevent it from rising against the edge of the bone. If it presses there it is soon ulcerated, and then you see fungus rising.

It is especially necessary to guard the dura mater during a fit of coughing. The patient should be raised up on renewing the dressings.

Every thing should be attempted to assuage a violent paroxysm of delirium, for then the brain is forced up, and the dura mater pressed against the bone.

The "handkerchief," or the double-headed roller, retains the dressings. Let the patient be laid with his head high.

Fungus or Hernia Cerebri.

When the dura mater is torn by the depressed bone, or when it is ulcerated by being thrust up against the sharp edge, we have to dread lest a portion of the brain be thrust through, or a fungus rise up.

A tablespoonful of brain has been forced out in a fit of coughing. The tumor is in part brain, in part a rapid growth, owing to the extreme vascularity of the brain. It will rise in a night to the size of an orange, if unresisted.

This tumor is a consequence of a force from within. The pulsation of the arteries of the brain, and

the occasional impulse carried backwards along the column of the veins causes it.

There is, independently of the hernia cerebri, an injury *from within*. The opening of the skull and dura mater permits the pressure from within to be concentrated towards the unsupported part of the brain. Hence the brain on dissection exhibits numerous spots of extravasation.

To guard against it, you must support the dura mater.

When it has taken place, you employ pressure to restrain it, yet not forcibly to push it back.

As it is often combined with suppuration, care must be taken to permit the discharge from under it. It is too often a fatal occurrence.

§ VII. TREATMENT OF THE INJURED INTEGUMENTS OF THE HEAD.

In contusion of the integuments of the head without open wound, there is a deceptive feeling as if the bone were fractured and depressed.

If the scalp be cut from the bone, as by a sword, or if it be torn, it is to be laid down in the hope that it will adhere.

If it be cut down, and the surface bruised by a bludgeon, still it is to be laid down on the bone, although being bruised, the probability of adhesion is diminished.

If the scalp be torn down, as by a cart-wheel passing obliquely over the head, and if the dirt be kneaded into it, it is better to poultice and wait for granulation.

Some say the scalp is to be laid down, as it can do no harm;

if it does not adhere we are no worse off. This is a mistake, for you do not know that it is not adhering until symptoms arise, and on introducing the probe under the flap, the bone is felt bare.

Do not on any occasion use needle and ligature to the scalp.

A punctured wound of the scalp (and a needle makes such a wound) is very apt to produce erysipelas.

The object of treatment in injuries of the integuments must be to subdue phlegmonous inflammation that it does not extend to the meninges; and therefore bleeding, cold lotion, purging, and nauseating doses of antimonials are necessary.

Another danger is the erysipelatous inflammation. It renders the wound formidable by causing sloughing, which leaves the bone bare.

In this case, tepid fomentation, with infusion of conium, may be applied over the dressings; and nauseating doses of antimonials administered, and the bowels relieved by small repeated doses of the sulphate and carbonate of magnesia in the form of draughts.

Let my last advice be, that you deliberate well before trepanning the skull. Never forget that you are inflicting a dangerous wound. The oldest and the most experienced surgeons are the least prone to have recourse to it.

CHAPTER XVII.

DISLOCATIONS.*

DISLOCATION is the displacement of the bones at their articulating processes. These are the accidents which most try the abilities of the surgeon. We distinguish—

1. Dislocation; 2. Subluxation; 3. Diastasis; 4. Compound dislocation; 5. Dislocation with fracture. These mark the extent of injury. Then there is a distinction, as the displacement is a consequence of violence, or of disease and relaxation. We have also consecutive dislocation, and we may fill the list with congenital dislocation.

Some of these distinctions may require a word in explanation. *Diastasis*: In this case it happens that the bones are displaced, but fall again into their place; seemingly nothing is wrong, yet the injury is great, by rupture of ligaments, &c.

Consecutive Dislocation happens in consequence of the original injury causing inflammation of the joint, a new posi-

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* There are certain subjects of previous study: the nature of the cellular membrane; of fascia; ligaments; the structure of joints; the nature of cartilage; the changes to which they are subject. Thus the student of surgery must diligently and repeatedly dissect the tendons and ligaments which surround the joints, reflecting, the while, on the different directions in which they may be sprained or torn.

Peruse diligently Sir Astley Cooper's work on Dislocation, and trust implicitly to what he delivers: a seemingly poor praise, yet how seldom to be bestowed!

tion of the bones, and perhaps a filling up of the articulating cavity.

Dislocation from disease. When disease relaxes the ligaments, and pours out effusion into the joint, as, for example, in the knee-joint when the patella is put out; or when disease in the shoulder-joint attended with relaxation, permits the muscles to draw off the head of the humerus.

Congenital Dislocation. Thus I have seen the two hip-joints play in and out, being imperfect from birth.

General Marks of Dislocation.

These are—pain and inability to move the joint when there has been no direct injury to the part; a check in the motion of the joint; unnatural direction of the bone; loss of convexity in the articulation; the head of the bone felt protuberant, or filling up a space unnaturally; rigidity of muscles from displacement of their tendons; and numbness from pressure on the nerves by the displaced bone, and the interruption to the pulse from the same cause.

In common cases of dislocation, there may be said to be two forces in action: 1. The external violence; 2. The muscular retraction when the surfaces of the bones are no longer in opposition.

It is this displacement by the action of the muscles which draws the head of the bone into a position where it is checked, and with difficulty withdrawn.

In dislocation, the capsular ligament and synovial membrane is either partially or entirely torn. The tendons also suffer from the displacement of their sheaths and groove, and are sprained or torn. The muscles are frequently torn, and with extravasation of blood.

If the bones remain unreduced, then new adhe-

sions are formed; in some cases new sockets for the head of the bone, the original one becoming less perfect; and, owing to the new position of the bone, certain muscles are thrown out of action, and waste.

Insomuch that in the attempt to reduce old dislocation these muscles are torn.

There are three forces to be employed. Let the *extension* be made by applying the laques or apparatus to the bone dislocated, not to those more distant from the joint. The *counter extension* means merely the resistance made by fixing the trunk or the bone from which the other is separated. The *lateral elevation* is of much importance, viz. the drawing of the limb laterally, or the affording a fulcrum which will enable you to raise the head of the dislocated bone over the edge of the socket.

Causes of Resistance to the Reduction of Dislocation.

These are, first, the new position of the ligaments, which now maintain the bones in their new positions, locking their heads together.[1] The muscles certainly resist, and resist the more, the longer the reduction is delayed; but this may always be overcome.[2]

[1] Too much of the difficulty is ascribed to the muscles. Is there any instance of difficulty greater than in the dislocation of the thumb? See also dislocation of the shoulder.

[2] And the best and safest way is by long continued extension before the effort is made. Bleeding is used, inducing sickness,—the warm bath.

In the operation the difficulty for the most part

is in fixing the trunk of the body; great care must be taken to guard the arteries and nerves.

I have observed complete paralysis of the limb from injury to the nerves by the laques. Let the surgeon calculate the power of the compound pulley before using it, or he may do irrecoverable injury.

We are apt to neglect the means of subduing inflammation after the reduction, not considering the violence which has been done; hence rheumatic inflammation and permanent weakness of the joint.

A question will arise, Should an old dislocation be reduced, and after what time? Sir Astley Cooper says the attempt should not be made in the dislocation of the shoulder after three months, nor of the hip after eight weeks.

A mistake prevails. These old dislocations are not to be *reduced* in the manner of a recent displacement; for then there is great violence done, even to the rupture of muscles or of the artery, and injury to the nerves. The mode is not by one attempt, but by a repeated—daily—often repeated and more gentle elongation of the adhesions. When you have succeeded, for example, in completely loosening the connections of the head of the humerus, you may attempt to return it into its original place. In these cases, you have nature favourable to your efforts. See a *paper by a Surgeon of Rouen, in the Repertoire Generale d'Anatomie,* for all the mischiefs that may arise from attempts at long delayed reduction.

CHAPTER XVIII.

INJURIES TO THE HIP-JOINT.

This is a subject of great practical interest.[1] Inflammation of the hip-joint causes a change in the position of the pelvis, and an apparent shortening of the limb; and let it be particularly noticed that the joint being hurt, it slowly degenerates in a very remarkable manner, producing a complete change in the form of the head and cervix.[2] The head expands, the cervix is absorbed, and the trochanters approach the brim of the acetabulum, so as to check the motion. The muscles of the hip waste, and the bones project unnaturally.

[1] Sciatic and nervous pains, rheumatic and gouty inflammation of the hip, and the secondary effect of injuries, give frequent rise to consultation.

[2] Unless the surgeon be familiar with the objects in a pathological museum, he will not easily believe how strangely the head of the bone may be disfigured. From inattention to this has arisen much of the question about fracture of the neck of the bone. However, let this be remembered, that a man receiving a severe injury on the hip (for example, being thrown from a coach), the surgeon examines him, and finds all in its place, and neither dislocation nor fracture: months having passed, and the patient being lame, the hip is examined, and it is declared to be an ill-treated fracture, or a neglected dislocation! The second opinion arises in ignorance; and the first surgeon consulted is not to blame.

Dislocation of the Hip-Joint.

The most common dislocation is where the head

of the femur lies upon the dorsum of the ilium. The next in frequency is when the head of the bone lies on the *foramen ovale.* It may be dislocated forward on the pubis.

In the incalculable variety in the direction of the *force* dislocating and of the position of the bone, there is hardly a direction in which the thigh-bone may not be wrenched or dislocated. 1. The head on the *dorsum ilii*; 2. on the thyroid ligament; 3. into the ischiatic notch; 4. upon the body of the pubis. The general principles, with a knowledge of anatomy, will serve to direct the surgeon in all these cases. But in the text I limit myself to two of the common occurrences, which the reader would do well to study.

Inquire into the nature of the accident—the direction of the violence. He has fallen sideways; the foot entangled he has come upon his hip.[1] In that case, being dislocated, you may expect that the limb shall be shorter; in some measure locked, with the knee turned inwards and the heel outwards. It is then a dislocation on the ilium.[2]

[1] One is plagued thus: When you observe that the limb is shorter, the patient cries out, "O, sir, it was always so!" The fact turns out to be, that he having an old diseased hip-joint, has fallen and sprained it. In the case of an old disease of the hip, the pitch of the pelvis is very apt to deceive us, by giving the appearance of a shortness of the limb. Then see that the neck or trochanter be not fractured, which by-the-by is not likely in a young or athletic person. In fracture the limb is more loose; can be extended, and even bent, though with pain, and the whole position is different. See *Fracture.*

[2] The shortness of the limb is in that degree that the toe of the dislocated limb rests on the dorsum of the other foot.

Previous to the operation, I do not object to the use of the warm bath; but I cannot think of punishing the unhappy patient by administering the tartarized antimony.

Reduction.

In hospitals, there should be a ring fixed in the wall of the accident ward; another sunk in the floor; to the first, the apparatus for fixing the trunk should be attached; to the other, the hook of the pulley.

Lay the mattress on the floor, and the patient extended upon it, inclining to the opposite side. First contrive to secure the pelvis. There is a long and broad strap, well padded, and having strong rings at the ends; this is put between the thighs, and brought round upon the groin before, and the hip behind, to the side of the body, and fixed with ropes to the wall. Let the perineum be well defended with tow, and the scrotum put aside. Roll the lower part of the thigh with a wet bandage; bend the knee-joint, and apply the proper belt,[1] so that it holds on the knee above the condyles. Carefully defend the artery and nerves in the ham with tow. Let the surgeon hold down the pelvis, and with the other hand feel the trochanter, and let him mark the change in the position of that process as the assistants pull.

[1] This band consists of a strong leather belt, quilted or padded on the inside, with straps, and buckles on the outside. It has two iron hooks, to which the cords and pulley are to be attached. Wet towels are the substitute in private practice.

The tackle being applied, the cords are for some time kept tight; then gradually the force is increased. An assistant in the mean time uses the leg as a lever, by carrying the foot across the other leg. He will assist in lifting the head of the femur from the dor-

sum of the ilium,—by rotating the limb inward, and the cord of the pulley being gradually and steadily pulled. The surgeon feels and hears a snap as the head of the bone falls into its socket.

The whole apparatus being relaxed, the patient is aware that the bone is reduced. The surgeon compares the points of the anatomy and is satisfied.

It may occasionally be necessary to put a towel round the thigh, close up to the perineum, and to draw the head of the bone outward, which facilitates its rising over the brim of the acetabulum; or it operates as a fulcrum when the knee is carried inwards.

Dislocation into the Thyroid Hole.

The accident, that is, the force acting to produce this dislocation, is different. Suppose a man unloading a cart, and he unexpectedly receives a heavy sack on his loins and the side of the pelvis; he is forced down, the extremity being stretched outward, and backwards. Thus the lower part of the capsule is burst, and the head of the femur thrust downwards and forwards; and so lodges on the obturator muscle and thyroid membrane.

The accident also happens by the foot slipping, so as to straddle the thighs asunder.

The marks of this dislocation are less distinct than in the former case. The limb is longer than the other. The trochanter is sunk, and the patient keeps his body bent forwards, or the thigh raised.[1] There is a hollow in the groin. The knees cannot be brought together without pain. The head of the bone is obscurely felt in its new position.

[1] On account of the insertions of the psoas and iliacus

internus muscles being carried with the lesser trochanter in its new position.

The reduction is to be attempted without the use of the pulley. The thigh is to be drawn in the direction in which it is found, and then the knee is to be carried in adduction, or towards the other knee; whilst the towel put round the thigh close up to the perineum, serves as a fulcrum, by which the head of the femur is lifted into its place.

Dislocation into the Ischiatic Notch.

The signs are not so distinct as when the head of the femur is on the dorsum of the ilium. The length of the limb is nearly natural. The knee is still in a degree turned inwards. The rotation is checked.

In this case the extension of the thigh should be made in a direction across the other thigh. The prominence between the place in which the head of the bone lodges and the acetabulum, is higher than in any other kind of dislocation, so that here especially we require a fulcrum, by carrying the towel on the inside of the thigh, close under the perineum, and to draw outward, whilst the thigh is elongated and carried obliquely across the other thigh. The reduction is difficult.

We must have our minds directed to the possibility of fracture of the acetabulum in examining a case of dislocation of the hip. When the acetabulum is split, the head of the femur is drawn up and the leg is shortened. The ease with which the bone is drawn down and moved in different directions, will save you from committing the mistake of applying laques to reduce a dislocation.

Dislocation of the Patella.

The knee-pan is most frequently dislocated to the outside. It may be struck in falling, so that it escapes like a wedge struck with a hammer, and lodges on the inside.

In persons who are in-kneed, the violent action of the quadriceps muscle may dislocate the bone without the knee touching the ground.

The reduction is made by extending the leg; raising the whole extremity so as to relax the rectus muscle; then pressing down the edge of the patella, so as to raise that which is towards the joint, that it may start over the condyle.

But if it be difficult to reduce thus, then the patella is to be pressed downwards; that is, towards the space between the condyle and the tibia; as it were by a circuitous way, to surmount the prominence of the condyle.

By the displacement of the knee from the synovial membrane, a part of the capsule must be torn, and there is effusion in the joint, for which the patient must be treated.

In examining the joint under the belief that the bone is dislocated, you will recollect that the same force may produce a very different effect,— the rupture of the tendon where it is inserted into the upper edge of the patella; or there may be a rupture of the ligament of the patella.

It would be an affront to an anatomist to give him the signs of dislocation of the tibia from the lower head of the femur; only let him not despair on account of the formidable nature of the accident. By

attention to keep down inflammation, recovery may be expected.

The lesser injuries by sprains are perhaps of more consequence to the practitioner; they turn out so ill if neglected. For example:

Injury to the Internal Lateral Ligament.

An old lady stepping from her carriage, or coming down stairs, sprains the inside of the knee. This must be cared for; the inflammation kept down; and the knee supported against a repetition of this injury.

The width of the pelvis and obliquity of the femur is the cause of the accident happening to women. The weight of the body acting through the oblique thigh-bone bears on the inner lateral ligament, and sprains or ruptures it.

A ligament thus injured inflames and is relaxed, or loses its firm texture. The knee by this means inclines inwards; the obliquity of the thigh is increased; the patient suffers a second and a third wrench, and becomes permanentl lame.

The semilunar cartilages are subject to displacement. The accident appears to happen in those who have weakness in the joint, and by a slight degree of force. The method of reduction recommended by Mr Key is to bend the knee to the utmost, and then straighten it; by which, it is presumed, the displaced cartilages adjust themselves again to the convexities of the condyles.

Were it not that we have the authority of the two best surgeons of our time, Sir Astley Cooper and Mr Key, to the frequent occurrence of this accident, I should be inclined to believe, that loose cartilages in the knee-joint have pro-

duced effects attributed to the displacement of the semilunar cartilages.

Compound Dislocation of the Knee.

This is a case for amputation.

Dislocation of the Ankle.

YOUR patient tells you, that his foot being entangled, he fell to that side; or he has stepped down unexpectedly; or dropped upon unequal ground, which twisted the foot outwards.

The strain is upon the deltoid ligament; it is lacerated, and the internal malleolus starts off the astragalus. You recognise the partial dislocation by the prominence of the inner ankle and the twisted position of the foot, the eversion of the sole.

[See Fracture of the Fibula.]

In reducing it, you relax the muscles by bending the knee and pointing the foot. The leg being held, the surgeon takes hold of the heel and the fore-part of the foot. The parts being adjusted, lay the leg on the outside and on the proper splint, having a foot-piece, the knee being bent.

You will have much difficulty in preserving the bones in their place, and a splint may be required on both sides.

A person stepping down a flight of stairs, the heel striking the edge of the step; or stepping down on the yielding step of a carriage, may dislocate the bones of the leg forwards off the astragalus. The heel projects, the toes are pointed, the foot apparently shortened, the tibia projects on the tarsus, and

there is an unusual hollow between the tendo Achillis and the tibia.

When the dislocation is complete, the tibia rests on the naviculare.

Let the assistant raise the thigh and hold fast; the leg being in a position to relax the tendo Achillis. The surgeon's hands are upon the heel and the fore-part of the foot.

Sometimes the luxation is partial, the fibula broken, and the malleolus internus projecting forwards.

In compound dislocation inwards, the astragalus is sometimes displaced, and so projecting as to require to be taken away altogether! The case is desperate, yet it may do well, as in the following case.

In taking out the astragalus, Mr Shaw says, that the chief difficulty which he experienced, in the case of F. Moore (Med. Gaz. July 1837), was to get the point of the knife introduced into the ankle-joint, so as to cut the capsular ligament from within, along its attachment to the astragalus. Although the astragalus was displaced from its connection with the os calcis and naviculare, yet it retained its relation to the tibia and fibula; and from the inner malleolus overlapping the side of the astragalus, the interior of the ankle-joint could not be laid open, so as to cut from within the joint. He was therefore obliged to saw through the astragalus, by which the bone was turned in its socket, and an open space was obtained between the surfaces of the ankle-joint; when the operation was readily completed. He was restricted in his incisions by the necessity of avoiding the anterior and posterior tibial arteries, which both ran close to the astragalus.

It is unnecessary to describe the manner in which the ankle-joint is dislocated outwards, or how the astragalus and external malleolus are broken. The knowledge of structure makes the nature of the acci-

dent and the mode of replacement sufficiently obvious.

The injury, when the foot is wrenched under a carriage-wheel, will present very great variety; but the practical distinction will turn on the degree of injury to the soft parts. Generally speaking, the ankle having suffered compound dislocation, by the wheel passing over the joint, is a case for amputation; the injury being much greater than in dislocation described above. After all, much will depend on the constitution of the patient. As in compound fracture you endeavour to close the external wound,—reducing the case to a simple dislocation. You must in the attempt to save the foot watch diligently night and day, using iced water and all the other means of preventing inflammation.

Dislocation of the Ribs.

The extremities of the ribs start from their connections in consequence of bruises, which squeeze the chest.

The most extraordinary instance which I have seen was that of a man who got between the wall and the lever of a horse-mill. The sternum and its cartilages were separated from the extremities of the ribs, yet he lived.

You try by expansion of the chest, and by pressure on the started extremity, to replace it. You are under the necessity of treating it as a fractured rib.

Separation of Bones of the Pelvis.

The bones of the pelvis are subject to disease, which separates them. They may be separated by violence, too often combined with fracture: but nothing can be done but by swathing the hips and loins.

The os coccygis may be dislocated. The patient

has slipped backwards, and hit a projecting point or a prominent stone or angle. The rectum is pressed upon, the muscles of the perineum are disturbed in their functions. To reduce the bone, place the patient on his knees and elbows; introduce the finger in ano, so as to push the bone outwards, and direct it by the fingers of the other hand externally.

The injury or sprain of the ligaments of this bone is not unfrequent, and the consequences are very distressing. The patient cannot sit; or in attempting it the part is hurt again, and inflammation kept up with great pain, as well as disturbance of the functions of the rectum and bladder. You must contrive pads, upon which the patient can sit without pressing on the extremity of the bone.

DISLOCATION OF THE UPPER EXTREMITY.

THE scapula itself may be in a manner displaced. When a person falling backwards puts out his hand behind him, the scapula glides so far back, that the lower angle slips over the edge of the latissimus dorsi. It will be reduced by forcing back the arm, and pressing down the angle of the scapula upon the ribs.

It more frequently happens, however, that the edge of the muscle is bruised against the scapula, and an ecchymosis takes place; the patient giving his surgeon an assurance that he struck nothing, and did not come to the ground at all!

Dislocation of the Clavicle.

The case which most frequently occurs is a sprain of the joint of the clavicle with the sternum; pro-

ducing strumous inflammation in and around the joint.

Besides attention to the scrofulous disposition and covering the joint with stimulating plaster, you must fix the arm so as to give rest to the parts inflamed.

The clavicle may be dislocated; although the weakness of the bone generally prevents it, by yielding to that force which would otherways wrench the joint.

The farther, or acromial extremity of the clavicle is oftener dislocated, in consequence of a person falling on the shoulder.

See that you do not mistake it for dislocation of the humerus. The accident (that is, the force applied) is very different.

The treatment is on the same principle with that of fracture of the clavicle,—to push the shoulder from the trunk, and to brace back the shoulders, and to support the arm so as to prevent the scapula falling low.

The best apparatus is that of Sir Astley Cooper, which is in the shops. It will be found a great comfort to the patient.

*Dislocation of the Humerus at the Shoulder.**

You will learn from the patient that he did not fall on the shoulder, the accident being a consequence of the extended arm acting like a powerful lever on

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* The reader should study this subject, in all its bearings, on the dead body.

the connections of the bones, bursting up the joint: when the muscles displace the head of the humerus.

Thus some of our first authorities attribute the dislocation into the axilla, to the circumstance of the capsular ligament being weak in that direction! This is a lame account of the matter. The cause is the raising of the extended arm suddenly and violently, by which the head of the humerus comes in contact with the acromion. The acromion is the fulcrum to the long lever, and the consequence is, the bursting up of the capsule below.

These are the signs of the humerus dislocated from the glenoid cavity of the scapula: 1. pain in motion; 2. the hand cannot be raised to the head; 3. the elbow cannot be pressed to the side without pain; 4. there is a flatness on the prominence of the shoulder; 5. perhaps the pulse is interrupted and the sensations of the arm numbed; 6. the arm is bent at the elbow, and to stretch the arm gives pain. Place the patient with his back towards you, and you will perceive that the shoulder has fallen, that the acromion is sharp and prominent, and that the insertion of the deltoid muscles takes an unusual angle with the humerus.

Observing these marks, and putting your hands to the shoulder, you raise the arm and press the fingers into the arm-pit, when you feel the head of the humerus. The pain from extension of the arm is owing to the long head of the biceps muscle retaining its hold on the edge of the glenoid cavity, whilst it is carried away in the groove of the humerus.

To reduce this dislocation, place the patient on a chair; pass a sheet under his arm and across his chest; give it to strong assistants, who are to hold him up against your efforts. Let a more intelligent assistant hold down the shoulder, pressing upon the

acromion. Take a wet towel, and throwing it into the form of the proper noose, introduce the arm into it, so that it comes above the condyles of the humerus; there draw the noose and fix it.

If you require assistants, you attach a cord to the towel, and ordering them to draw steadily, slowly, and with a gradually increasing force; the arm is to be carried horizontally. You take hold of the arm at the elbow, and bending it there, you rotate the bone. When you think the head of the humerus is sufficiently drawn from the axilla, and has reached the edge of the glenoid cavity, you put the fleshy part of your arm under the bone, close up to the axilla, and suddenly depress the patient's arm, when the head of the bone slips into its place.

In many instances you can do this, and reduce the arm without assistance. But, often, it is to be acknowledged, the surgeon is baffled in his attempt. To what is owing this great difficulty? In my opinion, solely to the remaining ligamentous connections binding the head of the humerus under the neck of the scapula; and to relieve it, the arm must be raised higher than the horizontal position. In fact, this is done in most cases of reduction; for the assistants who draw the arm overpowering those who sustain the body, the patient gradually more and more leans to the side; so that, although the arm be still drawn horizontally, the increasing obliquity of the trunk becomes equivalent to the raising of the arm.

When there is much resistance, do not be satisfied with pulling the arm directly out from the side. Carry it first across the chest, and then up to the face.

By this manœuvre the coracoid process of the scapula becomes a fulcrum to the humerus, by which the head is lifted over the edge of the glenoid cavity.

The mode of reduction with the heel in the axilla is very rude, but it must be done in remote situations, where you have neither assistants nor apparatus. *Lay the patient on his back; throw off your boot; take him by the hand; place your heel in the arm-pit; draw upon the arm for some time; then throw yourself across his body obliquely, swinging by his arm. I have not failed in this mode of operating; still it is not to be done unless other means have been tried.

The head of the humerus may lie forward under the pectoralis major. In this case the dislocation is easily distinguished; the elbow stands outwards and backwards.

In all cases of dislocation the head of the humerus is to be brought out of its remote place into the situation under the glenoid cavity, and finally reduced by the means described above.

The dislocation of the head of the humerus upon the dorsum scapulæ is very rare. Anatomy, and the just application of principles, suffice to direct the surgeon in all these cases.

Attend to high fracture and diastasis of the apophysis of the humerus, p. 126, p. 110.

Dislocation of the Elbow-Joint.

The accident is most apt to take place in young persons, before the coronoid process has acquired its full form and strength. The person falls forward on the hands; and the ulna, carrying the radius with it, slips off the trochlea. The projection of the olecranon declares the nature of the accident.

Reduction.—The surgeon places his knee anterior to the elbow-joint, and bends the joint over it. The

sides of the knee are like two fulcra, acting both on the humerus and on the bones of the fore-arm.

The difficulty is to raise the point of the coronoid process out of the posterior fossa, and at the same time to extend the arm. The intelligent surgeon will find means of varying the mode of reduction.

The bones of the fore-arm may be dislocated laterally. In this case the olecranon is projected backwards, and the head of the radius is felt behind, and to the outside of the external condyle. The reduction is to be performed as in the more common case of dislocation.

The head of the radius is dislocated from the sigmoid surface of the ulna. It lies before the humerus. The dislocation is ascertained by the sudden interruption to the bending of the arm, in consequence of the head of the radius striking the fore part of the humerus. The reduction is made by extending the hand (which is directly connected with the radius), drawing it downwards, and at the same time in supination; and when this is done, binding the arm at the elbow will preserve the radius in its place.

Dislocation of the Wrist-Joint.

Notwithstanding its exposed situation and complex structure, the dislocation of the wrist-joint is rare. When it happens, the knowledge of the bones and ligaments, and the general rules, are sufficient to the practice of the surgeon. The radius is dislocated from the lesser head of the ulna.

The sacciform ligament of the ulna is torn; the head of that bone is protuberant on the back of the wrist. When

reduced, splints and a roller are necessary to keep the radius and ulna in their due relations.

Dislocation of the Bones of the Hand and Foot.

I must not deny the possibility of dislocation of the bones of the carpus. They are of the form of wedges, and by lateral pressure may be made to start.

But it is of more practical benefit to know, that an inflamed and thickened state of the ligamentous covering of these bones deceives the surgeon into the belief that the bone is displaced. He is attempting to force a bone into its place, when he should be employed in soothing an inflammation of the periosteum or ligament. "Ganglia are mistaken for this accident." Yes! So says Sir Astley Cooper; but do not take his advice to "disperse the cloud of doubt which envelopes the mind of the surgeon," by a blow with a book.

Dislocation of the Thumb.

This is often a most troublesome accident.

I cannot attribute this difficulty "to the numerous and strong muscles of the thumb," but to the form of the heads of the bones being thrust through between the lateral ligaments.

The first bone of the thumb is dislocated from the metacarpal bone of the thumb. It is a consequence of striking a blow with the fist, or falling on the thumb. The nearer head of the first bone rests under the further head of the metacarpal bone, and consequently projects towards the palm.

Take the thumb in your hand, and bend it at the dislocated joint in the direction towards the palm.

By this you push back the great head of the bone between the lateral ligaments. Do not persevere with violence in pulling upon the thumb. The second joint has been torn off without reducing the first; it being impossible to overcome the resistance occasioned by the locking of the bones, tied together by the new position of the remaining ligaments.

When the *toes* are dislocated, the difficulties are the same, and the rule applicable to the thumb and fingers are applicable.

Dislocation of the Jaw.

There is some imperfection in the forms of the joint when the lower jaw is dislocated by yawning. It may be dislocated by a blow on the chin at the time the jaw is dropped.

We hear of spasmodic action of the muscles dislocating the jaw during the operation of drawing a tooth. Dislocation has been produced in a boy by his attempt to bite a large apple! Once produced, dislocation of the jaw is apt to take place from slight causes, and on ludicrous occasions.

When the dislocation is complete, that is on both sides, the mouth is open. If the jaw be forcibly raised, the inferior incisors project beyond the upper ones. The cheeks are full, and there are depressions before the ears; the saliva flows.

The reduction is accomplished thus: You wrap the corner of a towel round your thumbs; introduce the points of the thumbs thus defended deep into the mouth, and press down the last molar teeth: You have thus a fulcrum; now raise the chin by grasping it with the fingers.

The condyles go into their place with a snap, and the

thumbs are apt to suffer; slip them between the jaw and cheek.

The jaw may be dislocated on one side only. You recognise it by the open mouth and oblique position of the teeth; by the prominence of the coronoid process producing a fulness on one cheek: There is a hollow before the meatus auditorius compared with the other side. The reduction will be accomplished in the manner above described.

LACERATION OF TENDONS.

In a healthful and vigorous person, the muscular strength and the resisting power of tendons correspond. By indolence, or confinement, the tendon degenerates, and may be ruptured by the natural action of the attached muscle!

The *thecæ* will for the same reason sometimes suffer; all tendinous and ligamentous parts deteriorating for want of the due stimulus to perfection of structure, which is their natural action and play.

In sprains of the outer ankle by twisting the foot inwards, the tendons of the peronei, and their connections, are injured when the surgeon thinks only of the perpendicular ligament of the fibula. Hence arise ganglia, &c.

In running up stairs, the toes slipping from the edge of the step, the annular ligament across the instep is sprained. In going down stairs, the heel slipping from the edge of the step, the anterior part of the ligament of the fibula, that which limits the extension of the foot, is sprained. These sprains are very troublesome. You must restrain the part until inflammation has subsided, and the torn fibres have united. But, on the principle here noticed, there comes

a time in which the joint must be exercised, in combination with the usual means of removing chronic inflammation.

But the case of this kind of most importance, and very frequent occurrence, is *rupture of the tendo Achillis.* It happens in men of a certain age, who yet retain muscular strength, and who are tempted to exert themselves suddenly.

The father of a family is tempted on a birth-day to join the dance of the younger people; and being lusty, heavy, and of sedentary habits, he says somebody has kicked him on the back of the leg, and so he goes limping to a sofa.

The tendo Achillis may be quite torn across, or partially.[1] The fibres of the gastrocnemius or soleus may be torn from the tendon.[2]

[1] I have thought I could discover a rupture of the plantaris tendon.

[2] During life the muscular fibre excels the tendon in strength, so that the muscle itself is seldom torn. Thus, when it is alleged that the rectus abdominis is torn in oposthotonos, it is the intermediate tendinous portion which gives way. So, with regard to the *rupture of the fasciculi of the gastrocnemius or soleus,* it is a tearing of the tendon at the immediate attachment of the muscular fibres. So of the vastus internus or vastus externus at the knee-joint.

With regard to rupture of the muscles of the back, think more of rheumatism. The diggers of canals have an idea that a workman is good for nothing until he has ruptured a muscle of his back.

In the case of rupture of the tendo Achillis, the practice is obvious to the anatomist. 1. The knee must be bent; 2. the foot extended; 3. compresses lateral to the rupture applied, and a roller.

I may not affront you by telling you to take care that neither compress nor roller shall fall between the broken ends of the tendon. Yet on consultation I have often found it so.

The high-heeled shoe must be worn when the patient begins to move about.

Both Monro and Hunter suffered by this accident. The latter continued to move about, keeping his heel raised and his knee bent. The ingenious surgeon will find no difficulty in doing this, by having a high-heeled shoe with a strap brought down from a circular round the thigh over the calf of the leg, and attached to the heel of the shoe.

Ganglion.

Ganglions are distinct from diseased bursæ; they arise from a sprain, or some slight injury to the theca or sheath of the tendons of the hand or foot. In substance they resemble the structure from which they arise. They are firm and dense sacs, having a fluid soft and viscid, and not unlike synovia. In some instances a double bag may be seen on dissection, a finer inner membrane within the tendinous sac.

At first you should leech and foment; afterwards, when they are more confirmed, you may apply blisters and stimulating plasters, with compression: finally, they may be punctured, and their contents pressed out into the cellular substance, where it will be rapidly absorbed. Bursting these by a blow is an awkward proceeding, and not a sure one.

When these sacs form with some modification of structure on the foot, they are for the most part consequent on continued pressure and friction. They are called *Bunions.* The principle here (as every where when no specific action has been excited), is to avoid the cause.

Mr Aston Key gives a paper on this subject in Guy's Hospital Reports, No. iii.

CHAPTER XIX.

OF BLIGHT AND MALFORMATION OF THE EXTREMITIES.

THIS is an obscure subject; one which occasions great uneasiness to parents, and much fruitless trouble to the surgeon. It is difficult to say on what it depends, that a part of the frame should be arrested in its growth, and that in the end there should be the arm, or leg and foot, of a child as it were, attached to an adult body!

Thus one person has a diminutive finger: another has the whole extremity smaller than the other; perhaps weak and imperfect in some classes of muscles; or one side of the jaw is not developed; or the whole side of the face is smaller; or one eye is small, with perhaps a squint in that eye.

It is, however, very necessary to be aware of this increasing defect, else the practitioner is led into great faults. It is an extensive subject, more fitted for lecture than for these volumes.

The club-foot belongs to this subject.

Club-Foot.

The child is born with the foot distorted. The tarsus and metatarsus have the bones twisted, and their joinings imperfect. The toes and the whole foot are turned inwards.

It may be turned outwards; hence the terms *varus* and

vulgus; the first distortion inwards, the latter distortion outwards.

On dissection, I have found the defect less than could be imagined.

The treatment consists in taking the foot in the hand, and gently but perseveringly producing passive motion in all the natural directions of the joints; thus exercising every part, and yet so that the infant shall be more pleased than hurt. When the foot is thus suppled by motion, it is put into a shoe with proper apparatus to restrain it. This must be re-adjusted when giving pain, and occasionally removed; but persevered in till the sole of the foot be turned to the ground.

This kind of boot has an iron sole; a plate fixed to the side of the sole, which ascends on the leg, and is embraced by a collar below the knee. A strap going round the foot, and buttoned to the upright plate, gradually turns round the inverted sole.

When the club-foot has been neglected in childhood, it is a great misfortune; the dorsum or outside of the foot is turned to the ground, which, having no provision in a natural pad, suffers. When both feet are in this condition, the progression is miserable. It is in this condition that the attempt at reduction may be aided by the division of tendons.

Another defect is a straight position of the foot, combined with a weak tendo Achillis.

In all these cases you may take the aid of mechanism, assisting the weak class of muscles with springs, and appending weights to facilitate the passive motion of the joints. These exercise your ingenuity, and give you a deserved preference to practitioners either ignorant of the principles, or wanting ingenuity.

In young ladies a weakness of the ankles is frequent; which permits the inner ankle to project, and the arch of the foot to sink. Attending to the constitutional source of weakness, and supporting the joint, you will require to exercise it.

Walking, still permit the ankle to yield. Let her put her feet close together, and then curtsy by bending the knees. In this manner the ankle-joint is made to play without yielding inwards.

Having finished External Injuries, I reserve the DISEASES OF THE JOINTS, a distinct and very important subject, for the last division of the second volume.

DIVISION II.

OF THE DISEASES OF THE NATURAL PASSAGES, AND THE OPERATIONS PERFORMED FOR THEIR RELIEF.

THE operations required to be performed on the natural passages—the urethra, rectum, œsophagus, and larynx—require great nicety, and a mature judgment; and indeed, innumerable lives have been lost by ignorance and a rash hand in treating this class of diseases.

§ 1. THE OPERATIONS ON THE MOUTH, PHARYNX, AND LARYNX.

The Tongue.

The affections of the tongue are of consequence to both physician and surgeon—since they may be symptomatic of diseases requiring surgical assistance. The subject is of great intricacy. The nerves of the tongue, their various relations, and the sensibilities of the tongue, form a subject of much interest. You find loss of sensation at one time—at another loss of taste—and, worse than all, vitiated taste. You meet with strange sensations in the tongue; as of a hair drawn across it—or as if it were clogged with viscid matter. There is temporary loss of speech; or loss of the power of deglutition while speech is retained. These are often symptomatic of various other affections or diseases, which must be taken into view. By such considerations we are brought to understand the various sympathies of the tongue, and led to comprehend how much surgical complaints may depend on remote causes, *e. g.*

Ulceration of the Tongue.—The tongue is often ulcerated from playing on a tooth, which has become ragged by a portion of the enamel having broken off; or on tartar which has collected on the teeth. The incessant motion causes the superficial abrasion to become a callous ulcer, with sharp edges and a depressed foul centre. Without such mechanical cause, disorder of the stomach will produce these ulcers.

Small recent ulcers of the tongue may be touched with the solution of the lunar caustic, to take off their sensibility; but we should follow this by attention to the diet and the state of the bowels. In more confirmed ulcer, you file down the ragged tooth, and order a vomit (which has a remarkable effect, by agitation of the viscera), and insist on regular discharges from the bowels; following the vomit with such tonics as the powder of cusparia and rhubarb; correcting acidity, if it prevail, by the infusion of columbo and liquor potassæ, or magnesia and the liquor calcis. Failing these, I have been successful with small repeated doses of the subnitrate of bismuth in combination.* When the edges of the ulcer have been hard, I have used pounded sugar, with a few grains of calomel. The patient wetting the point of the finger and touching the powder, rubs it gently upon the hard substance.

A simple ulcer on the tongue, by the continual motion, may become so irritated as to resemble a malignant disease, growing hard and irregular on the edges, and deeply excavated. I have seen such

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* Borax and sugar is the best application, or borax and mel rosæ.

℞ Sodæ Boracis	.	℥ii.
Aquæ Rosæ	.	℥viii.
Mellis despumat.		
Tinct. Myrrhæ	.	āā ℥, as a wash or gargle.

ulcers yield to proper treatment, with the addition of a bag embracing the tongue.

The mercurial fetor of the breath, and the tongue indented against the teeth, will enable you to distinguish the ulcer which arises from mercury.

The *scirrhous tumour* of the tongue may be operated on either by the ligature or the knife. In order to the performance of the first, you take the curved needle and ligature; pass it through the tongue behind the tumour; cutting off the needle, and consequently having two ligatures, you tie them so that they embrace the tumour between them. It is remarkable that an organ which appears, and which is in reality, so delicate, should sustain this severe treatment with little irritation.

If it be possible to cut out the diseased portion of a triangular shape, and the hæmorrhage be stopped without the cautery, the sides of the wound may be drawn together with a ligature.

The surgeon never appears to less advantage than in attempting the removal of deep-seated disease in the tongue by its extirpation. The tongue must be rudely seized with hooks and drawn out; the portion is then cut off, and the actual cautery used to stop the hæmorrhage. I have never performed this operation. If you think of doing it, examine well the state of the glands in the neck and under the jaw. If they be diseased the operation is ineffectual, and you are deeply responsible. It is recommended to make incision into the tongue, when swollen from mercury so as to endanger suffocation; yet that is an unhappy time to make incisions at all. I have seen the tongue chronically enlarged, and have been inclined to attribute this state to quack pills, which had been taken regularly and for an indefinite time. Antimony thus taken might produce the effect.

Division of the Frenum Linguæ.

The frenum is sometimes unnaturally strong and short. It may affect the speech, but cannot interrupt sucking; for sucking is effected by the sinking of the jaw. Nurses will insist on the division of the frenum. The operation is not devoid of danger, for a small vessel being opened the infant sucks and swallows its own blood. Mr Cruickshanks (the same who wrote on the lymphatics) snipt a child's frenum; by the time the mother had walked home to the city the child in her arms was dead! with an immense coagulum in its stomach.

If you must cut the frenum, do it by passing the curved bistoury behind the ligamentous edge, and draw it to you. Your assistant in the mean while introduces his forefingers, opens the mouth, and forces back the tongue so as to stretch the ligament; or you may take hold of the frenum forcibly between the finger and tongue, and feeling the firm margin of it, snip it across. The scissors with a guard are useless.

The frenum has its use; to cut it quite through is to endanger the tongue being swallowed back into the fauces, so as to suffocate the child! J. L. Petit reduced the tongue to its natural place twice, and on the third occasion the child was suffocated: "Un enfant, à qui on coupa le filet immédiatement apres sa naissance, etouffa cinq heures après."—Tom. iii. p. 267.

Ranula, Grenouillette.—This is an incysted tumour which forms under the tongue. It is transparent, having distinct veins upon it. It enlarges, pushes back the tongue, and interrupts mastication, deglutition, and speech.

I have taken the patient to old and experienced practitioners, to ask what they called the complaint? They have

answered, Ranula! I have then passed the Anel's probe into the sublingual duct, shewing it to be quite pervious. Therefore, I do not give the definition—" a tumour under the tongue from an obstruction of the duct."

An obstruction of the sublingual duct is very painful, and is attended with symptoms not to be mistaken. You see the duct inflamed and obstructed with matter; and when the patient eats, *i. e.* when the salivary glands are excited, there is a pain which extends under the jaw, and which is to be attributed to the distention of the duct and gland with saliva.

Treatment.—When you puncture the ranula, a glairy fluid escapes, but the relief is temporary. By puncturing again and again, the sac thickens, but the disease is not cured. Some pass a seton across it; a most unpleasant mode of cure, and not certainly effectual. I have operated on this tumour by passing a strong tenaculum through it, and then placing the blades of the curved scissors behind the tenaculum, I have cut away the greater portion of the sac. In addition to this, we dip lint in solution of caustic, and put it within the remaining portion of the sac.

Salivary Calculus under the Tongue.—These calculi are to be thought of when the patient complains of the symptoms described as attending obstruction of the sublingual duct. The duct may be sounded with the probe, although the calculus is generally to be felt with the finger under the tongue.

They are to be removed by slitting up the duct.

In Mr John Bell's work you find the title of *Salivary Tumours*, and under it a graphic description of most formidable tumours about the throat. I am not satisfied that these tumours are salivary; at all events, the seton will not obli-

terate them. They should be largely opened; the sac, as far as possible, drawn out and cut off. Nor should the surgeon who miscarries be severely censured; they are unmanageable. See Sacculi about the throat. Hildanus and Marchetti give examples of the worst effects of ranula.

The salivary glands are not often diseased. I have more than once taken the tumour of the parotid gland (which the surgeon supposed he had extirpated), and shewn that salivary gland to be healthy, and have dissected out a diseased lymphatic gland from under it! I have done the same with the tumour which the operator called a tumour of the submaxillary gland, and have shewn the mass to consist of a diseased lymphatic gland, surrounded by the salivary gland in a natural state. I have stopped the surgeon in the midst of his operation, and shewed him that the parotid retained its peculiar and distinguishable character; and inducing him to cut deeper, have seen him dislodge the lymphatic gland, the real tumour, from under the parotid gland.

Fistula of Steno's Duct.—When the saliva flows from the cheek (in consequence of a wound), you have to consider whether this proceeds from some of the lesser branches, or from the substance of the gland, or from the trunk of the duct. In the former case, steady pressure on the part, the jaw being braced firm, will probably suppress the discharge. Escharotics, or the nitric acid, may be at the same time employed.

The motion of the jaw, and the excitement of the gland by mastication, defeat the surgeon's intention. In the operation on the main duct, it is necessary, by general and very considerable pressure on the whole gland, to suppress or diminish the secretion.

When the fistulous ulcer arises from the division of the duct itself, it requires a very nice operation, and a great deal of attention. It will be in vain to

use a canula.[1] The better way is to pierce into the mouth, and to keep the passage open by seton, whilst you heal the outward wound.[2]

[1] Mr John Bell, in using the canula, let it slip, and it went backwards so far as to require a deep incision behind the angle of the jaw for its extraction.

[2] Construct the seton in this fashion: Take a ligature of four threads, and doubling it, attach to the loop a fine piece of fishing-gut, or a strong hair. By this *gut* or hair you draw the seton from within outwards; the threads keep open the inner part of the wound, whilst the gut hardly interferes with the union of the outer wound, whether it shall be brought together by the twisted suture, or treated with nitric acid.

Tonsils.—It has been observed, on the subject of abscess, that a gland being inflamed, produces suppuration exterior to it. It is in this way that, in *Cynanche Tonsillaris*, suppuration occurs in the folds or arches of the palate. I advise no deep punctures in search of this matter. Put plaster round the bistoury, in such a manner as to let the point project, and scarify the projecting glands, using a gargle to encourage bleeding.

I have been two or three times called in haste to perform bronchotomy for quinsy. I have found the patient lying with his head and neck covered with flannels, and a stimulating liniment or poultice about his neck, and he snoring in great terror. But upon assuring him of safety, making him sit up, and bathing his neck and temples with vinegar and water, he breathed freely, and there was no longer thought of dying! I say this I have often found to be the result; but I shall not deny the possibility of bronchotomy being required.

The frequent return of inflammation occasions a chronic enlargement of the tonsils. There is in this

nothing malignant, and it may be reduced without an operation of *extirpation*. Scarification and gargle will diminish it. Projecting portions may be cut off, or a larger part included in a ligature.

To throw the ligature, you pass a strong tenaculum through, near the base of the tumour. You put the mouth of a curved canula on the point of the tenaculum, and holding them so, your assistant throws over the ligature, and with the assistance of a ring draws it tight.

The Uvula.—The uvula, by successive attacks of inflammation, becomes relaxed, and hangs low, so as to tickle the glottis and cause a continual dry cough, and sometimes vomiting.

You may draw it up by the application of cayenne pepper and astringent gargles, or at length you may snip a portion off. Seize it with teethed forceps, or pierce it with the tenaculum, and snip it with the scissors. Unless held it slips from the blades of the scissors.

Fissure of the Palate.—Some of my pupils, in imitation of M. Roux, have succeeded in closing the fissure of the palate. It is an extremely difficult operation; but, on the other hand, the effects of this imperfection are such as to make a successful operation a real triumph of art. He who would succeed in this operation must study for himself; he will hardly follow a description. My conception of the operation is this;—that it be done in three stages: 1. I would advise the ligature to be passed first; 2. Then to pair the edges by means of the hook and

curved scissors; 3. To incise the sides of the velum or palate, so as to give freedom to the flaps; and, finally, to draw the ligatures.

The Harelip—Cancer of the Lip.

As the operation for cancer of the lip so generally succeeds, it gives us reason to doubt whether the disease is cancer, or any thing more than an ulcer aggravated, and the base thickened by the incessant motion of the lip; and probably this is the reason that the disease is generally in the lower lip, which has by much more motion in speaking and mastication than the upper lip.

This consideration suggests, that in those diseases of the lip we should try the effect of arresting the motion of the part. A poultice does this in some measure; but if, in addition to the application to the sore, the lip be arrested in its motions by the application of straps across it, we may have the pleasure of seeing a gradual amendment without operation.

Whilst you strap the lip to keep it steady, touch the sore with a painting brush, dipped in solution of corrosive sublimate, and dress with a liniment consisting of the pulv. hydrarg. cum cretâ, Peruvian balsam and honey.

When the portion is to be cut out, you may make your assistant stretch the lip over a bit of wood, shaped so as to enter between the lip and the gum. Whilst he stretches the lip over it, he at the same time compresses the artery against the edge of the wood. You operate by entering the point of the scalpel at the base, and cutting first on one side of the disease and then on the other, so as to take out a triangular portion.

Or again, your assistant taking hold of the lip on both sides of the diseased portion, you seize the centre part, and with a long sharp pointed knife, passed from within outwards, you cut out a triangular portion, including what is diseased.

Let the part bleed a little, and then pass the hare-lip needles, and use the twisted suture.

If you operate on any occasion use all your care and skill. The needle should be passed in half an inch from the edge of the cut, and brought out close to the inner edge. See that in entering it again into the opposite lip, you do it at a point exactly corresponding. A second needle will be required. Throw the thread over this needle, so as to stop the bleeding, and pause a little. Then taking off this thread, or adjusting it with more care, bring the edges accurately together, and twisting the ligature round the needle in the figure of 8, spread out the threads so as to cover the space between the needles. The blood will form then into a plaster, so as to keep the edges supported and adjusted.

If the operation fails, it is from drawing the edges of the wound too much together, and not allowing for the swelling of the parts.

The patient is enjoined neither to laugh nor speak; and if there be danger of the lip being drawn, the needle may be protected by the dry suture; that is, by plasters attached to the cheeks with ligatures, which may be tied over the lip.

Some surgeons are satisfied with using a common surgeon's needle and thread, to bring the edges of the wound together. This does very well when the lip is accidentally divided, when there is no loss of substance, and the tumefaction pushes the surface together.

The operation for malformation of the lip requires the exercise of ingenuity on the same principles.

1. The lip is simply fissured. 2. It is deformed if there be two fissures with an intermediate portion, which, by the condition of the portion of muscular fibres belonging to it, stands out. 3. With the fissure of the lip there may be a defect of the palate plate of the upper jaw, so as to form a communication between the mouth and the nose.

The simple fissure of the lip is operated on much in the manner described: the edges of the lip are cut so as to present a broad bloody surface of contact when brought together by the twisted suture.

If one or more of the incisor teeth project, they are not to be taken away, but forcibly crushed down; for which purpose it may be necessary to divide a part of the alveolar process with a small chisel.

If there be two fissures with an intermediate portion, I would not advise that portion to be cut away as I have seen practised: separate it from the gum, force the shelving piece of wood under it, and with the scalpel and tenaculum give it a triangular form, and so pare the edges of the lateral fissure that the centre piece may fall in wedge-like between them.

The operation may be done at twice; the centre portion to be joined to one side, and when the adhesion is perfect, complete the operation by joining the other side.

When the operation is performed in a child, in the third and worst condition of the case, we may expect the chasm in the roof of the upper jaw to diminish. The breadth of the face in those cases proves that the upper jaw bones are separated as well as cleft; and something may be done to approximate them. In the dead child I have found it possible to

close the chasm, by squeezing the cheeks together; and I must therefore suppose that good may result from pads on the cheek of the little patient, pressing with a spring truss. At a later period, a metallic apparatus, laying hold on the teeth and alveolar process, and screwed together, or acting with a spring, may tend to close the fissure.

As a last resource, the dentist makes a false palate, which enables the patient to speak and eat with comfort to his friends.

Formation of a New Lip.

When the lower lip is destroyed by ulceration, the case is a very miserable one, as the saliva flows continually. My friend the late Mr Lynn of the Westminster Hospital (the neatest operator of his day) performed a cure very happily.

> He kneaded a piece of wax, moulding it to the vacuity; and having ascertained what was necessary to supply the defect, he laid this down upon the integument of the chin. Then calculating the loss which would be consequent on the twisting of the flap, he cut and dissected up the skin, leaving it at its upper side. He then pared the edges of the remaining part of the lip, and turning round the flap, he fixed it in the manner described with needles and the twisted suture.

Of the Teeth, Gums, and Jaws.

You can have no interest in the subject, nor understand the diseases of the teeth and gums, unless you make yourself familiar with the anatomy and physiology. The subjects which should occupy you are, 1. The state of the gum before the rising of the

teeth. 2. The succession of the teeth, and their time of rising. 3. The connection of tooth, gum, and alveolar process. 4. The formation of the permanent teeth. 5. The peculiarity of the *dens sapientiæ*, &c.

Scarifying the Gums during Dentition.

You will notice with interest that the progress of the teeth whilst still within the jaw, even during bad health, do not produce symptoms; and that it is the pressure on the gums, and consequent ulceration of the surface, that occasions extraordinary distress. This, however, does not take place always, or necessarily, but is a consequence of irritability connected with bad health. The symptoms are, itching in the gums, with a copious flow of saliva; the gums become red and swollen; there is purging, or a cough, and the child is fretful and feverish. In a greater degree this local irritation produces a furred tongue, and vitiated or interrupted secretion of bile. (See the Essays of Dr Cheyne on the Atrophia Ablactatorum.) Convulsions, partial or general paralysis, may supervene.

(I may here observe, that the irregular rising of the teeth at a later period, produces many affections; and if there should appear to be a crowding of the teeth, with squinting, fever, pains, or convulsions, it is proper that one should be drawn.)

There is no doubt that a touch of the lancet on the distended gum, which lets the tooth free, is very often attended with the disappearance of the most formidable symptoms. The late Dr Denman was not satisfied unless the lancet rattled along the range of concealed teeth. This can be of no service; it is the rising tooth that irritates; whilst this practice, by opening all the sacs, makes the teeth rise irregular in form and black, and even affects the formation of the permanent teeth.

But in all cases of distress during the period of teething, never forget that there are two causes in operation, and that it is peculiarly necessary to guard the child's health; and if the child has been improperly weaned, maintain your opinion against the mother's prejudices, and let the child be fed by the breast of a healthy woman.

You will be asked to give advice on the propriety of performing operations on the teeth; and you should carry some facts in your memory.

As the alveoli partake of the constitution of the teeth, rise with them, decay with them, and shift with them, we understand how the teeth may be made to change their place by introducing wedges between them. The overhung jaw may be corrected by making the patient close his teeth on an inclined surface.

A tooth is provided with a disposition to rise, which is intended to counteract the pressure of the opposite teeth. Accordingly, when teeth are lost on one jaw, those of the opposite jaw are apt to jangle and get loose. This is a reason for pivoting teeth, viz. to save their opponents.

We have no means of acting directly on the teeth, and we can only maintain them by operating on the gums. To keep the gums firm is the object. Sometimes they require scarifying; rubbing with the finger is good; or brushing with tincture of myrrh and bark, and spirit of camphor; and when there is toothach, destroy the acidity by using pure chalk with spirit of wine.

Parulis.[1]—There is something not easily to be understood in the matter of caries of a tooth, but there is no place for discussion here. When *a gum-*

boil forms, it is a miniature representation of what I have described under abscess. The inflammation in the tube and cavity of the tooth causes pus to be formed at the fang, which gradually makes its way, opening the alveolar process and pointing in the gum. It is to be opened, which gives immediate relief.

[1] In the old authors, *parulis* is an inflammation and abscess in the gum. When there is a fleshy excrescence, they called it *epulis*.

Pivoting.—If you make a section of a tooth, you may observe that the canal is not always round and equal in the calibre; hence arise accidents in the operation of pivoting.

A tooth being carious, and partly gone in the crown, may be cut off, and another joined to the fang by a pivot. The crown being cut off, and the surface of the root or fang made smooth and a little grooved, an instrument is put into the canal, by turning which round the nerve is cut and extracted, an operation of great pain; but sometimes the canal being unequal, the nerve is not effectually destroyed by twisting round the instrument. The consequence is grievous, for the pivot of the new tooth bruising the nerve, gives rise to pain and convulsion.

Another effect is to be observed in the diseased state of the tooth, and consequent gum-boil; the matter is permitted to make its way out by the hollow of the tooth, but by the pivoting this is prevented, and the effect is occasional inflammation, pain, and discharge of matter by the gum.

The patient finds himself more comfortable when the dentist furnishes him with teeth, set in a range

of gold or ivory, with so exact a fitting to his remaining teeth and gums that no irritation is experienced.

Necrosis.—The teeth being decayed, and causing inflammation deep in the jaw, give occasion to necrosis of the jaw.

The tooth, gums, and alveoli, as we have noticed, are one in constitution; and I have seen the whole range fall off in mortification after fever, reducing the jaw to the state of that of a very old person.

This would lead us to the disease to which children crowded together and ill-fed appear to be peculiarly subject, *the canker of the mouth, gangræna oris.* Read John Pearson, Principles, p. 287.

Epulis.—This is a tumour partaking of the nature of the gum from which it arises—that is to say, it is smooth, firm, insensible, and vascular. It rises between the teeth, in time displaces them from the jaw, and presses into the mouth.

When this tumour is cut off, it quickly rises again, and it will not be extirpated without the cautery, or the removal of the gum, teeth, and alveoli connected with it.

You cut down between the teeth on each side of the tumour, using the small saw to cut the alveoli. You then, with strong cutting forceps, embrace the whole, and cut it, the gum and alveoli, from the base of the jaw, and you would do well to apply the actual cautery to the remaining surface.

The artery spouts out freely, but previously to the operation you calculate the chasm to be left in the jaw. You cut a piece of cork to correspond with it, and surrounding this cork with lint, you dip it in the muriated tincture of

iron, and place it in the chasm; you then close and tie up the jaw, so as to compress the bleeding surface.

When the disease is not radically removed, it grows out frightfully into the mouth, and shoots its roots into the jaw. When in the upper jaw, it shoots into the antrum, and from thence it extends and fills the cavities of the face.

A tumour of a similar character rises from the antrum, of which presently.

Before leaving the subject of the teeth, we must contemplate another effect of their disease—the formation of an abscess in the lower jaw (*spina ventosa*).

The term was invented when churchyard bones were collected, and when the soft tumour or the contained matter had disappeared from the cavity.

The lower jaw, for example, expands and grows under the influence of disease; and this matter being freely evacuated, the walls of the bony abscess happily collapse again.

But too often there is a tumour, a morbid growth in which the jaw participates, and which requires the whole to be taken away. The most remarkable instance I know of, and the boldest and most successful operation of this kind, was performed by Mr Syme. The cast and tumour is in his collection.

When we consider the subject anatomically, by which I mean the attachment of the tongue by its muscles to the internal spine and symphysis of the jaw, it occurs to one that, when the jaw is taken away, the tongue will be drawn back by the styloid muscles, and the patient suffocated. In fact this did occur in Mr Syme's case, but the tongue being held forward for some time, the action relaxed, and the patient ultimately recovered.

ABSCESS AND TUMOUR IN THE CAVITIES OF THE FACE.

Dropsy of the maxillary sinus is said to be a consequence of obstruction of the communication and the nose. I have never seen the disease.

Abscess in the cavity of the maxillary bone may be suspected when there is a pulsating pain deep seated in the face, after which there is a colourless puffiness of the cheek. You will not mistake a common face-ach or a toothach, which you will find attended with tenderness of the cheek.

A patient will present to you with one side of the face enlarged, and somewhat œdematous. You must examine into the nature of this swelling. It is not a mere swelling from toothach. It is chronic. It has enlarged very gradually. Is it matter in the antrum? Has an abscess formed there from disease of the teeth, the fangs of which project into that cavity or reach its floor? Or is it a more formidable disease of the antrum, a tumour?

You strike the anterior molar teeth and find them tender, and you observe matter oozing by the side of them,—this is favourable,—it indicates abscess. The abscess may make its way into the nose, or between the alveoli and cheek.

The case being disclosed, the second molar tooth and all the teeth which are diseased should be drawn. It may be necessary not only to draw the second molar tooth, but to perforate through the socket into the antrum.

But unless the discharge be free and the relief perfect, a larger opening should be made by perforating the side of the antrum above the alveoli.

The patient should have emollient gargle to take into his mouth, and press up into the cavity. There is no necessity for a syringe.

I have said it is happy when matter is observed, because this abscess is a mere effect of irritation, and

when the cause of it is withdrawn, the cavity falls into a natural condition. But it may be a tumour, a solid mass with a tendency to morbid action and rapid growth. Then, indeed, it is a formidable disease.

This *fungous tumour* presses out the walls of the antrum, the alveoli soften, and the teeth appear to stick in a soft mass. The cheek is thrust out and the face disfigured: the nasal wall of the antrum is pressed towards the cavity of the nose.

To be determined, and to act decisively, we must look forward to the consequences. This fungus, soft though it be, in time destroys all it meets. It raises up the socket and presses out the eye. It goes back upon the throat and presses upon the eustachian tube. It presses on to the opposite side of the face, destroying the ethmoid and centre part of the sphenoid bone. It projects into the mouth. Having thus encumbered and destroyed every external organ of sense; speech, taste, smelling, sight, hearing gone,—it presses through the cribriform plate of the ethmoid bone, and reaches to the brain; and so the patient falls comatose.

Now we perceive the necessity of bold measures at first.

I have succeeded in destroying it by taking away the alveolar process in the range of the upper jaw, on one side, and laying open the bottom of the cavity, or rather exposing the tumour and then setting to it, with the actual cautery.

This is not a painful operation, however dreadful in the contemplation. You raise and defend the cheek (I think I employed a shoe-horn), and you bore in the cautery at every visit! I have found my patient crying because I went through the ward without applying the red-hot iron.

In short, the destruction of these fungous tumours is not to be done at once, but by long continued severe treatment. One of the most severe operations, nay, the most severe of all, is dissecting or tearing away the half of the upper maxillary bone, containing this fungous tumour within it!—an operation

which I have seen my colleague Mr Syme successfully perform.

See before you attempt this that the disease has not propagated itself backwards to the cells of the palate bone, and that it is still confined within the antrum.

The cheek is cut up with a decided incision from the lip to the margin of the orbit. The maxillary bone is separated from the jugum on one side, from the nasal process and the palate plate on the other. The floor of the orbit is taken away, and the posterior part, with all its branches of the fifth pair, crushed and drawn away! That the human frame can bear such an operation is wonderful: to witness it is a hard duty. I am decidedly of opinion that my mode of proceeding with the cautery is the mildest and most effectual.

DISEASES OF THE CAVITY OF THE NOSE AND FACE.

Turn to Mr John Bell's fourth volume for formidable cases of tumour and polypus in the cavities of the face.

Here, too, anatomy gives interest, and enables us to understand the nature of the diseases. You study the nerves of the face, the fine vascular exposed membrane which invests these passages, and the delicacy of the bones which form the cells; and from all of these peculiar results arise. The sense of smelling is singularly disturbed in apoplectic diseases.[1] The sneiderian membrane is the most exposed, the least supported, of any of the frame, and its vascularity causes it to burst out in bleeding, often giving token of plethora, and often serving as a safety valve to the turgescence of the venous system. The bones, too, by their formation and their delicacy of structure suffer, and at the same time produce an effect on tumours, hereabouts, that give

them all the aspect of malignant disease without being so.

[1] The relations of nerves produce remarkable effects. *Sternutatio* is not always owing to irritation or disease in the nose, but to disorder of the stomach or intestines.

[2] *Hæmorrhage.*—Epistaxis is frequent and harmless in youth; more deserving of attention when in the adult, it is attended with weight, pain, heightened colour and pulsation in the temples; and still more when there is lassitude, weight in the limbs, and cold feet. It is only when in excess that the bleeding is to be stopped.

When a person is bleeding from the nose he naturally pokes his head forward, which constringes the veins of the neck and acts like a ligature. The free erect posture with cold sponging is to be first attempted.

Plugging is rather a disagreeable remedy. A cord attached to a catheter wire is passed from the nostril behind the velum. It is seized and brought through the mouth; a plug of lint being attached to it, it is drawn back so as to fill the posterior nostril, whilst the anterior is compressed.

This may be required when polypi are cut with the knife.

The better mode is to take a piece of gut tied at one end, introduced by means of a probe into the nose, and this is to be forcibly distended with a cold solution. It compresses the abraded surface.

Catarrh, *Corysa*, *Ozæna*, are affections of the mucous membrane which covers the bones.

You would do well to consider the constitutional derangements of the mucous membrane; its continuity and the rapidity with which a certain condition is propagated,—from the nose to the skirt of the lungs,—from the fauces to the verge of the anus, and observe what is said, p. 18, that the mucous surfaces may be influenced by general sympathy as well as

particular organs. And here you may turn to your medical authorities on the subject of *Hemicrania*. Deschamps has a good description of "Migraine," p. 206. See *Tic*.

Ozæna is an ulcer of the sneiderian membrane, which discharges a fetid purulent matter. It is at first attended with the symptoms of catarrh, with tumefaction of the ala nasi, and in the morning obstruction by viscid mucus. The discharge is accompanied with sneezing and slight hæmorrhage. We are to fear that it may spread like a herpetic ulcer round the ala nasi to the cheek. This is a scrofulous disease, or it may be a consequence of syphilitic cachexy; it is, at all events, connected with some defect of constitution.

Distinguish it from abscess of the antrum, or of the cavities of the frontal bone.

The preparations of copper and of zinc are used locally, with the citron ointment and white precipitate of mercury; also fumigations. But chiefly you must apply yourself to the constitutional cause.

When the bone is carious, the smell is most offensive. But hardened mucus will by its presence excite offensive secretion, without breach of surface; and a piece of rag left in stopping bleeding, produces an intolerably offensive discharge.

The *septum nasi* often bulging to one side, and appearing like a tumour in the nose, is mistaken for a polypus. I have found it ulcerated from the application of caustic, the surgeon thinking in this absurd way to destroy the polypus!

But without any mistake, this inequality in the position of the septum, by occupying one side and excluding the air from it, restricts the breath. From this imperfection the patient has desired relief, on discovering that he did not breathe freely through

one nostril. Mr Copeland has repeatedly perforated the septum with an instrument like a very small trephine, to the great relief and soulagement of the patient. It allows him to draw his breath more freely.

Polypus.

The sneiderian membrane gives rise to polypus. This disease presents in various degrees, and embraces tumours of very different dispositions.

The membrane swells so as to obstruct the passages. This is sometimes a consequence of low, damp, and cold habitations; also of reduced health, as of that condition which follows small-pox.

This affection of the general membrane does not give rise to polypus, nor is it attended with pain or with hæmorrhage. It is in this condition of the passage, that Le Dran and many following him advise the use of bougies, some of lead and some of elastic tubes. These are all wrong, for the passage of the nose is irregular, from the projection of the spongy bones, and the instrument pressing unequally, causes ulceration, and if persevered in, caries.

Use injections of zinc, and as a tonic, the mineral acids.

Of Polypi authors make these distinctions; 1. Vascular and fungous; 2. Lymphatic; 3. Scirrhous; 4. Sarcomatous.

I have no doubt that there are considerable varieties, but this I know for certain, that, from their situation, they are, whether simple or malignant, attended with formidable consequences.

When they arise from the membrane of the turbinated bones, for example, and escape through the posterior nares, being of a venous and vascular nature, they expand, and by the constriction of the passage they bleed. Then, again, if of a firmer nature, whether malignant or not, by their mere pressure they destroy the mucous membrane, make carious the delicate bones, and are therefore attended with

pain, as if the bones of the face were squeezed in a vice, and with fœtid discharge and with blood. Again, this matter is swallowed, and produces diarrhœa; and so the patient is at last exhausted by bleeding, purging, and pain!

The primary symptoms are these. The patient does not breathe freely in damp weather. He loses his sense of smell. The tumour is perceptible, and plays backwards and forwards like a valve. On examination, a round, pale, or rose-coloured tumour is visible. Then it closes the lachrymal canal, producing a weeping eye. It pushes behind the velum, so that speech is affected. It presses against the eustachian tube, so that the hearing is lost. It will at length hang down upon the throat, and affect the epiglottis and the breathing.

We can understand how it may become strangulated by its growth, shooting from the posterior nostril, and so drop off!

You have to consider what course of remedies will correct disease of the mucous membrane, and to restrain its growth by strong injections of the solution of zinc. When a lobe occupies the front, even to the effect of injections, it is necessary that it should be taken away with the forceps.

An operation is performed with the ligature, which is so far effectual when the lobes of the tumour extend into the throat. The ligature is passed by means of the proper canula, through the nose. It is seized behind the velum with the blunt hook, and brought into the mouth. Then passing the fore and middle finger into the mouth, and with them expanding the noose of the ligature, the noose is pushed back behind the polypus, when the cord being drawn

through the nose with the left hand, the whole tumour is caught, then the canula being pushed forward, it is noosed and strangulated.

Fifty times have I seen this spluttering operation attempted and fail! I have succeeded better in my object by using forceps, which could be fixed and their handles withdrawn. Introducing them and seizing the tumour, I have compressed it; let the instrument hang during the night, and brought it away with what it had embraced in the morning. There is in this no pain experienced, and with injections for which it makes room, I have succeeded in destroying the disposition in the membrane.

I am half ashamed to mention what I see recommended, the knotted cord; a seton cord, so knotted that being drawn backwards and forwards through the nostrils, it acts like a file breaking down the soft tumour. In this way, however, viz. by a cord drawn from the nose through the mouth, sponge or lint saturated with astringent lotion may be effectually employed.

The worst sort of tumours commence in the cavities of the face, and commit ravages long before they present the appearance of polypus in the nose.

DISEASES OF THE PHARYNX AND ŒSOPHAGUS OR GULLET.

Having gone over the anatomy of the pharynx, the forms and nature of the arches of the palate, the muscles, the nerves of the tongue and pharynx; having considered the act of swallowing, the nervous sympathies, defects of actions,—we come to the distinct diseases.

Bag formed in the Pharynx.—There is a case nar-

rated by Dr Baillie, in which a cherrystone lodged in the lacuna of the pharynx, and by each succeeding act of deglutition, a little of the food was forced in, and formed at length a large bag.

But these bags form differently, from an impediment in swallowing, in which the voluntary act of propelling over the food does not meet in corresponding automatic action, and the pharynx is distended; the food or drink distends the mucous membrane, pushing it between the fleshy columns of the constrictor pharyngis. The bag thus formed increases gradually by what is deposited in it, until its size becomes so considerable as to press on the œsophagus, and the edge projecting like a valve, receives the greater part of what is swallowed!

This is a most distressing condition, the unfortunate man starving with food before him.

Sacs are formed in another way, by suppurations behind the pharynx bursting into the passage.

This is a matter which should alarm us for suppurations which communicate with the passage for the food. We have already learned that inflammation of the throat is prone to form suppurations exterior to the tube. In some (happily rare) cases the abscess breaking into the passage, the food falls into it, irritates by its presence, and keeps up the abscess. The bag thus formed has no covering of muscular fibres like that described by Dr Baillie, and there is no reaction or vomiting up of its contents. We have distress, hectic fever, and starvation!

Washing out the sac, feeding with a tube, are the means suggested, and I have thought of opening the sac from the neck, that matter may not lodge, but have an exit to be washed away.

Stricture of the Œsophagus.

Recollect the peculiar structure of the œsophagus, the nature of the mucous membrane which forms its interior, and

the looseness of its muscular coa which is at the same time so strong as to be called *Tunica Vaginalis.* It is in the inner mucous membrane that the permanent stricture takes place. But the muscular and vaginal coat is very often affected, and if you consider the complication of muscles, and the intricacies of nerves about the throat, you will readily comprehend how spasm accompanies and aggravates the permanent stricture, and is often the sole cause of difficulty, the muscular derangement being taken for permanent or true stricture.

In the hysterical female, the muscular coat of the œsophagus is spasmodically affected. In the middle of dinner she will be incapable of swallowing a morsel; she will have this repeatedly, and for years, until it becomes almost habitual; but depending more on the state of the stomach than of the uterus.

There is a remarkable analogy between the œsophagus and pharynx, and the urethra. Both are canals lined with a mucous membrane, governed by peculiar sensibilities, tied up or connected to neighbouring parts, and surrounded with irritable muscular fibres: We are perpetually exposed to mistake the nature of their affections, and to miscalculate the extent of spasmodic affection.

The pharynx, of a conical shape, terminates behind the cricoid cartilage, where it is firmly bound, and this is the narrowest part of the canal; and as the catheter introduced into the urethra pitches on the side where the tube is bound up by the ligament to the ossa pubis; so here when the œsophagus bougie is used, it is apt to lodge by the side of this narrower part of the tube.

The symptoms of stricture are, a gradual increasing difficulty in swallowing, until liquids only, or small morsels, or soft food, can be taken. Mucus collects about the part, and hence cough and the action of vomiting is excited. The attempt to swallow

produces distention of the pharynx and pain in the ears.

I have so often traced this complaint to quinsy, that I have no hesitation in saying that it is a product of inflammation. Some formidable cases have presented to me, which were produced by obvious causes,—swallowing boiling water, swallowing soap lees.

Treatment.—We must in all cases alleviate the spasm, by friction of the neck with æther, camphor, and the ol. succini. The compound galbanum pill may be ordered, with an antispasmodic draught, and a linctus given with opium, to sip, and which should be allowed to lodge about the stricture. Dashing of cold water is in some cases of pure spasm effectual; to which we add all the means of resolving hysteric spasms, as clysters of assafœtida. I could quote authority against using the bougie at all, in stricture of the œsophagus, yet the relief is inexpressible! The mucus collects, the irritability increases, and the difficulty of swallowing and disposition to retch is frequent: this is, at all events, temporarily removed by passing a bougie.

The use of the bougie in stricture of the œsophagus ought to be an operation of caution and delicacy, for by rudeness the tube may be ruptured, and then a lamentable death is the consequence. The liquids swallowed find passage, but they are forced into the cellular membrane around the gullet, and pain and increased distress is added to the suffering from inanition.

The fluid destined for the stomach finds a ready passage through the loose cellular membrane of the neck into the mediastinum, where I have found it!

That surgeons of experience may commit this fault I am fully aware. A. B. a surgeon of the first eminence, could not pass a bougie. The patient went to C. D. who did it at once. When the surgeon met him, how did you accomplish it? says A. B. "Why, by a mode I have." The œsophagus was perforated, and the patient died in three days after.

Therefore do all with caution; there is no cure performed in this case by forcing a bougie, even if it go through the stricture.

I have been in the use of passing the bougie at regular intervals, so as to preserve the passage free. There is another method, effectual and safer;—by using a kind of probang, with a conical piece of sponge. This dipped in a weak solution of the nitrate of silver, and passed repeatedly through the stricture, dilates it, clears away the mucus, and removes the disposition to spasm. The patient swallows with comfort for a long time after this process. But to the question we must come at last, what is to be done when a wretched creature is actually starving, in consequence of stricture in the œsophagus? I look in vain for authority and advice. I have attempted, by incision on the side of the neck, to divide the stricture and use a tube, but failed.

If this operation is to be performed, it must only be in the most imminent fear of death from starvation. The incision should be made on the left side of the neck; when completed, a catheter may be passed into the mouth and pharynx, and with the point of it, the lower part of the pharynx may be brought out through the incision; but you must not cut into the tube above the stricture, else in future every thing swallowed will escape there. The œsophagus must be opened below the stricture, a tube introduced, and the patient fed and fostered for a time: after which attempts may be made to force the stricture from below.

You will do well to recollect that there is a scirrho-contracted œsophagus as well as of the rectum, in which no operation need be attempted, and where you must confine your efforts for relief to emollients, and issues or setons.

With regard to stricture lower in the œsophagus, I have not met with them. And remember how you may be misled; 1. by aneurism in the arch of the aorta; 2. by suppurating glands in the mediastinum; and, 3. by scirrhus and ulceration of the œsophagus itself.

Whatever interrupts the continuity of action in the muscular coat of the œsophagus, or causes spasm by ulceration and morbid sensibility, will in symptoms resemble stricture of the tube.

FOREIGN BODIES IN THE PHARYNX AND ŒSOPHAGUS.

You will remember that in the act of swallowing, the guard of the wind-pipe is not a mere piece of mechanism, for the sensibility of the neighbourhood of the glottis is such, that it commands the muscular action of the glottis, and closes the chink as the morsel passes over. Hence it is that any thing sticking and exciting spasm, without actually closing the passage, will notwithstanding suffocate.

When a piece of meat or gristle stops in the pharynx, there is then danger of choking, and a man may die of an obstruction, which might have been removed by a long finger, the handle of a spoon, or any thing which, by unfixing it, enables the muscles of the throat either to reject it or to swallow it.

The pharynx being funnel-shaped, the morsel sticks at the contracted part of the tube, just behind the cricoid cartilage. Do not push the morsel with the probang, until you have endeavoured to fish it up, for you may impact it more firmly. If it be of moderate size certainly it may be pushed past the sensitive glottis, and the person instantly relieved; and

this may be done by any thing at hand,—the handle of a spoon. It is recorded to have been done with a leek!

I have always advised my young friends on going into practice to have a good store of probangs, hooks, and forceps, of every size and curve.

Bones, pins, and indeed all indigestible sharp bodies, are to be carefully withdrawn; for which various contrivances will suggest themselves. For example, you could take a piece of fishers' gut or bristle, and loop it on the end of a bougie, making a dozen of turns, so that it would catch a sharp or projecting body.

A wire may be twisted so as to acquire firmness, or to take a curve suited for the passage, and the doubled extremity of it may be bent up into a loop, and in the form of a blunt hook. This being passed between the side of the tube and the foreign body may unfix it, and, with the assistance of the natural action of ejection, bring it into the mouth.

You will not let yourself be deceived by the patient's sensations. When a fish-bone has hurt the surface in passing, it gives a sensation which persuades the patient that it is still there.

If such a body does stick it festers or causes ulceration, which, from what has been detailed, is not a light circumstance; therefore there is every reason for having the body withdrawn.

A pin sticking across the pharynx has penetrated into the internal carotid. The *preparation* was in Dr Hooper's Collection.

A man that cannot invent such an instrument for the nonce, is not likely to use the most perfect with dexterity.

In all operations on the throat, the first duty is to give assurance to the patient that he is now safe, since you may by that calm his perturbation.

It may become necessary to perform œsophagotomy, for the extraction of the foreign body. It will not be a difficult operation for an anatomist.

1. An incision anterior to the sterno-mastoid muscle, dividing the platisma myoides as well as the skin. 2. Go down with the handle of the knife upon the omo-hyoideus. 3. Introduce a lithotomy staff by the mouth; make it project in the neck, and open the tube by cutting upon it. 4. Introduce a pair of forceps into the groove, and by separating the blades enlarge the opening, so that the finger may be introduced and the body felt; after which, with the forceps and the blunt hook, you withdraw the body.

On the subject of foreign bodies sticking in the œsophagus, consult the Mem. of the Acad. of Paris, vol. i. p. 444, a précis by *M. Hevin*. The paper is full of instances, which, by perusing, you are made to think of many contrivances.

The Stomach pump.—When I tell you that I have found, *on dissection*, the injection of broth destined for the stomach, in the cells of the lungs, you will be careful in introducing a tube into the stomach.

Putting a dry towel on the fore and middle fingers of the left hand, you lay hold of the tongue and bring it forwards; this is for the purpose of undoing those folds of the passage against which the tube may hitch. But those who give this advice should have said also, that by pulling the tongue forwards, the epiglottis is raised, and if care be not taken to make the point of the tube move along the posterior part of the pharynx, it will very readily fall into the glottis. By pushing back the tongue the epiglottis is shut down. However, before fluid is poured into the tube, the mouth of it should be put through a sheet of paper, and the

candle put to the mouth of the tube to see that no breath moves it; and you should also be assured that the tube can be pushed deep, another proof that it is in the œsophagus.

§ 2. OPERATIONS ON THE LARYNX AND TRACHEA.

Once more I repeat, it is essential to dissect and study the apparatus in the larynx and trachea, whose function it is to preserve us from injury every day and every hour, and yet which by a disturbed action produce suffocation. I have told you that I was early called to the study of this subject by the death of a fellow student, in whom after death there was found nothing else amiss than a small pustule on the margin of the glottis. Had I published each case and circumstance as they occurred, I should have anticipated much of what has been written on this subject.

In visiting the collection of Preparations in the College of Surgeons of Edinburgh, you may see that I diligently attended to this subject. See preparations, Nos. 1276, 1284, 1285, 1293, 1295, 1298, 1299, 1300, 1302, 1303, 1304, 1305, 1306, 1307, 1308, 1309, 1310, 1311, 1312, 1335. These dissections were for illustration of my lectures.

Wherever muscles are implicated in a disorder, the distress comes in paroxysms. Not only are the muscles of the glottis thus influenced in the cases we have to consider, but the muscles also of respiration generally. Thus, if a tumour, or an aneurism of the aorta, or of the arteria innominata, press upon the trachea, though it might be expected that the cause being mechanical the effect would be uninterrupted; yet it is not so—the difficulty of drawing the breath and the sense of suffocation comes in paroxysms, and in

the intervals the patient is easy—even the pulse does not indicate the condition in any other way than when affected by the general weakness.

This principle we must carry with us in considering the diseases of the larynx.

Cynanche Laryngea.

I have had occasion to notice the manner in which inflammation spreads along the mucous surfaces. It is in this manner that an inflammation originally in the pharynx extends into the larynx, and then is attended with the most formidable consequences. Sometimes on holding down the tongue, the epiglottis may be seen standing up highly inflamed, and by its turgescence unfitted to its office of a valve; in which case there will be choking on the attempt to swallow. The first class of symptoms are consequent on increased sensibility in the passage, the second on turgescence of the membrane. This turgescence has of late been called œdema. See a paper of Dr Edward Percival, Med. Chir. Trans. vol. iv. p. 297. Mr Porter, in the 11th volume, gives the instance of a young gentleman, suffocated by œdema, dead in his bed on the morning following his first complaining of sore throat.

> The sufferer complains of sore throat; in the evening of the same day the respiration is loud and hoarse, the inspiration long and difficult; he cannot lie—he will not sit—he paces the room in great distress—and thus he passes the night in paroxysm, struggling for breath! He speaks in a hoarse whisper, and points to the pomum adami as the seat of his complaint. At the end of the second day, or morning of the third, the face is pallid and a little swollen; there is much anxiety in the countenance, whilst the pulse is fre-

quent and labouring; he becomes indifferent, comatose, and dies.

The important matter here for the safety of the patient, and for the surgeon's character, is to know that there is a period when tracheotomy is too late to do service.

The patient does not die in a violent paroxysm of suffocation; he is less disturbed, and in a manner to deceive you when all hope is over. The lungs have become affected by the long labour of respiration; effusion has taken place, and he would die, however free the passages might be made.

The case narrated by Dr Farre, in which the operation was performed by Sir Astley Cooper, corresponds exactly with that narrated in the College Catalogue. Sir Astley says: "He was gasping for breath; every muscle that could be brought into action to assist respiration was employed; the pulse quick; the face and lips pale; the pupils dilated." When such are the symptoms it is too late to operate.

Tracheotomy must be performed early to be successful; laryngotomy is an incision too near the seat of disease.

When laryngotomy is performed, and a tube introduced, if the patient survive for a time another misfortune befals; the pressure of this tube excites suppuration in the membranes. See the case described by Dr Percival, *loc. cit.*, where, on dissecting the membrane on the posterior part of the trachea, it was found coated with pus to the base of the cricoid cartilage. I found it impracticable to use the tube; Mr Lawrence rejected it, and cut a portion out of the trachea.

There is another disease which requires the division of the trachea in preference to the larynx—an ulcerated condition of the *sacculus laryngis*, a chronic condition of the parts, sometimes scrofulous, or it may be venereal.

Phthisis Laryngea.—When abscess bursts into the larynx there is danger of suffocation. This, however, is not from the matter, but the irritation of the ulcer in so sensitive a spot. The membrane of the larynx is subject to ulceration chiefly in a highly scrofulous constitution, (also in syphilis). The patient expectorates pus (we should rather say seems to do so, since its source is not in the lungs); in respiration there is a wheezing noise; the voice is husky, and in a whisper. I long since, in hospital reports, recommended the solution of nitrate of silver to be squeezed into the glottis, by means of a piece of sponge attached to a catheter wire. The late Mr Vance adopted the practice. Tracheotomy may be required to save from instant suffocation; the cartilages become absolutely necrosed in the disease. Dr Hunter narrated a case where the cricoid cartilage was split up. I have found one of the arytenoid cartilages hanging and vibrating in the passage.

If there should be hope of a cure, tracheotomy might relieve the motion of the parts, and procure rest.

When I have performed laryngotomy for this disease, the relief has been only temporary.

The operation may be required in croup. It was successfully performed on a boy of seven years by the late Mr Chevalier. "About an ounce or more of frothy mucus gushed out through the opening." In my early days, I made the dissections for Dr Cheyne's Dissertation on Croup. It will be seen, by perusing that work, that the child is sometimes choked by the membrane formed by inflammation on the inside of the larynx and trachea. In a case by Mr Blair, the operation appears to have been performed too late, the child dying of the secondary effects of the disease.

It does not appear that in these cases care was taken to keep the passage open until the breathing apparatus had perfect relief. They seem to have thought it sufficient to take away the concrete coagulable lymph.

The Operation of Tracheotomy.

The patient is upright in a chair; his chin is supported as far as he can permit, for he is mo-

mentarily in danger of suffocation. 1. An incision is made on the fore-part of the trachea, two inches in length ; you permit it to bleed—which will tend to relieve him. 2. You proceed to dissect upon the fore-part of the trachea: Leaving the isthmus of the thyroid gland at the upper part of your incision: you lay aside the thyroid veins ; and you tie them if they continue to bleed. 3. You divide two rings of the trachea, and slit the intermediate membrane of the upper ring which is cut. This gives immediate relief, and the patient breathes freely.

In this operation the position of the patient is awkward ; his face is thrust forwards, and the muscles (sterno-hyoideus and sterno-thyroideus) start out whilst the trachea is pulled downwards and backwards, so that it is one inch deeper than your anatomical experience would lead you to believe : It is also alternately raised and drawn down.

There may be a question about taking out a portion of the trachea.

In this operation to relieve the breathing, the opening must be free. I am doubtful if the passing a canula through the nose into the larynx will be effectual. See *Dessault*, Œuvres Chirur. tom. ii. Read Mr Lawrence's cases, Med. Chir. Trans. vol. vi. Mr L. takes away a portion of the trachea. My fear in that case is of granulations pressing in upon the calibre of the tube. He censures the use of an instrument which I used, but I used it only to hold aside the integuments.

In Dr Percival's case, the operation was performed too late, and I fear imperfectly. "He spoke with effort, and the tone of his voice was still that of a hoarse whisper." He should not have been capable of speaking at all, if the opening had been free. Dr Farre's important paper on this subject is in the 4th vol. Med. Chir. Trans.: the operation too late, and the place of operation too near the seat of disease.

Laryngotomy.

This is a much easier operation. It is called for suddenly when there is immediate danger of suffocation, from foreign bodies drawn into the windpipe or sticking in the pharynx.

A child at play draws in with his breath a pebble or a stone of some fruit; and it may be that this body, fixing in the sacculus laryngis, or in the grasp of the glottis, the child is suddenly suffocated. Sometimes the paroxysm ceases, not by the expulsion of the foreign body, but by its being drawn deeper into the windpipe. Still the child is in imminent danger, since by a change of posture, or sudden exertion, the stone or pebble may be thrown again into the larynx, and again excite the spasmodic action of the glottis, and suffocation.

Read M. Favier, Mem. de l'Acad. de Chirurg., for some curious experiments on dogs. Look to my paper on the action of the Trachea in the Phil. Trans.; my clinical lectures in the Med. Gazette.

The Operation of Laryngotomy.—You have marked the relation of the parts; you have drawn your finger from the base of the os hyoides to the pomum adami; you have carried the finger still downwards, and marked the sinking in between the thyroid and cricoid cartilages. There is the point for which you have to aim.

The incision is a very little lower than the pomum or projection of the thyroid cartilage. Having dissected down to and exposed the membrane in the free space just below the thyroid cartilage: you pierce the membrane with the knife, and introducing a small spatula, or the handle of the scalpel, and turning it round, you thus open the lips of the incision; immediately the patient breathes freely, the harsh sawing sound of difficult respiration is exchanged for the soft siffling sound through the wound.

I have elsewhere narrated the case where my patient was so suddenly relieved, after three days and nights of suffering and exertion, that she fell asleep, and that so suddenly that I thought she had died!

Now, if the case is one where the stone sticks in the glottis, the probe should be introduced upwards, and the body shoved into the pharynx or mouth.

I do not foresee the necessity of slitting up the thyroid cartilage; it must greatly disturb the *cordæ vocales*. Desault slit up the thyroid cartilage; Bichat argues in its favour; Mr S. Cooper describes the operation methodically. It is unnecessary in the case of a foreign body, and hurtful in the instance of disease. The cricoid cartilage being an entire ring, to cut it through would imply violence in opening it in an elderly person.

But if the body be not found there, it may be downwards in the narrow part of the trachea. On one occasion the operator, our house-surgeon, conceiving that he had done enough when he had thrust his probe from the incision into the pharynx, let the child die; and I found a pebble sticking in the tube within a quarter of an inch of the cut. I have had considerable difficulty in extricating half an almond-shell from the trachea. You should be therefore provided with small forceps and hooks, lest you may have to do something of this kind.

While Ferrand was surgeon to the Hôtel Dieu, a man was brought in with urgent symptoms of suffocation. Tracheotomy was performed, but only blood and mucus were discharged. He died. A piece of stone was found lodged in the sacculus.

It is one of the common instances of men writing surgery without experience, that you are told to make the child laugh to throw up the body from the trachea into the larynx. Why it is a great matter if you can get the child to be serious and quiet. But whilst it lies on a pillow, with a cut in its throat, it will be a difficult matter to make it laugh. However, before commencing your operation, you should try to discover by symptoms whether the foreign body lodges above or below your incision.

There is another reason for early operations in all those cases, not yet noticed. The death from effu-

sion on the lungs I had long since explained in lecture. But it appears that, after a seeming complete recovery, disease may be set up in the lungs; and that, at a more remote period, the patient may be lost by the consequences of the violent action during the paroxysms.

The subject continued under Wounds of the Throat.

§ 3. DISEASES OF THE RECTUM.

In one sentence we may express the happy results of the peculiar sensibilities, and the appropriate muscular apparatus, at the lower extremity of the intestinal canal, by observing the consequences of an *anus* at the groin. The unhappy patient has not the discharge announced by any token. There is no provision of lymphatics to consolidate the motion. There is no receptacle to permit the fæces to lodge innocuous till a convenient season. Hence the unfortunate person had better cease to be. All this is provided for in the natural canal; and these provisions should be studied to learn how to treat affections of this region.

Stricture of the Rectum and of the Anus.

I shall describe three conditions, all consequences of inflammation, however differently produced. The anus is subject to irritation and cutaneous inflammation, which at length produces stricture in the orifice itself. If it be our business to relieve pain, this is a matter of consequence, as I believe the pain is greater than from any other complaint. The effect is to produce chops and ulcers on the inside of the anus; and when the stool comes down, these tearing up, cause the patient to bellow with pain.

In consultation with that most intelligent surgeon Mr

Copeland, he told me that one of his patients could so little contain himself during the agony of going to stool, that the watchman broke in, conceiving murder to be committing in the house! Mr Copeland's practice is to divide the mucous membrane for about an inch with the straight bistoury.

The orifice being too small for the introduction of the finger, the straight probe-pointed bistoury is passed in about three-quarters of an inch; the finger is forced in after it, by which the mucous membrane is divided in a direction towards the coxis. You need do no more but divide the mucous membrane: but do that effectually; the relief is inconceivable.

The rationale of this operation is, that, by the division of the membrane, it yields to the pressure of the stool, by which the ulcers are no longer torn open, and they are permitted to heal. The opiate clyster, the anodyne ointment, the gradual dilatation by the bougie, are tedious and ineffectual means, compared with this touch of the bistoury.

It is truly surprising to find so much written on this subject by foreign authors, without ever touching the points of practice. For example, Richerand Nosographia.

The Common Stricture of the Rectum.

The most common place of stricture in the rectum is about an inch and a quarter within the verge. It presents to the finger a circular membrane, perforated in the centre. There may be hardening and irregularity around it, but that is a secondary consequence of inflammation.

The symptoms of stricture in the rectum are marked: 1. Constipation and irregularity, with the appearance of diarrhœa; 2. The fæces small and tape-like, or of an irregular shape; 3. Distention of the belly until painfully relieved at long intervals; 4. Flatulence and sickness. This condition may prevail until all the symptoms attributed to strangulated hernia shew themselves.

A very natural question arises, Why is it that this stricture is found so constantly at a certain distance, viz. when the fore-finger is introduced past the first joint? Constipation is the cause; and by frequent urging of the bowels, or rather of the abdominal muscles, whilst there is no corresponding relaxation in the orifice, the inner mucous membrane of the rectum is protruded over the inner edge of the deeper sphincter ani; and this becoming habitual or frequent, an inflammatory action and consolidation is set up. When the stricture is formed, and the cause continuing, there arises, as I have said, hardness and irregularity around the stricture, and it becomes more complicated.

Treatment.—The cure of this complaint is to be accomplished, 1. By regulation of the bowels, and thus removing the cause: by laxatives and enemata.*

It will sometimes be necessary (and it is a delicate operation) to pass a small tube past the stricture, and inject, so as to dissolve the matter that lodges above.

The cure is to be accomplished by the use of the bougie. The rectum bougie is made of elastic gum, smooth, and a little conical; but it is not better suited for its purpose than a candle. Be in all those cases where you have to dilate, gentle in your operation. Violence does no good, for there

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* The mildest laxatives are used; as milk, lime-water and manna; or sulphur with confec. sennæ and nitrate of potass.—the ol. ricini, &c.

℞ Mannæ Opt. . ℥i.
Ol. Ricini . ℥iss.
Gum. Acaciæ . ℥ii.
Spirit. Myristicæ ℥i.
Aquæ puræ . ℥x. Ft mist.
Add Liquor. Potassæ, gtt. xii. (to make the ingredients unite.)

If more active medicine be required—

℞ Pulv. Cretæ cum Hydrarg. gr. viii.
... Scammon. Co. . gr. x.
... Cinnamomi . gr. v. Ft. Pulv.

Aloes, they tell you, irritates. Use the watery extract in combination. Aloes taken before dinner gives less irritation to the lower part of the canal.

comes on reaction; and remember that, with so seemingly harmless an instrument as this, you may bring on peritoneal inflammation.

It will be better to cut the stricture than to do violence by pushing a conical bougie. You take a straight bistoury, that has only a part of its edge sharp. You introduce your finger, and over it the bistoury laid flat on the finger. When the cutting part is within the stricture, the edge is turned up, and so you notch it first on one side, then on another; after which you resume the use of the bougie.

Warts about the anus produce stricture. They narrow the orifice. They form within the orifice, keep up a discharge, and bleed with a formed stool. They arise from an acrid discharge, and that, I believe, from disordered function higher in the canal. Let this condition be distinguished from cancerous disease; it is a mere consequence of irritation.

You snip them off, and use a strong solution of zinc as a wash, or liquor plumbi acetatis; and the citrine ointment, or the ungt. gallarum cum opio, introduced on the bougie.

Scirrho-contracted Rectum

Is a more formidable disease. The extremity of the canal is studded with glands, and this is a carcinomatous disease of these glands. At once you infer its dangerous nature; and when the case presents to you, you have only to hope that it is not *the disease*, but an aggravated condition of stricture.

The disease may begin in the anus or in the gut. The worst cases I have seen began in the side of the anus like a common pile; but it is hard and smooth towards the gut, becomes very painful, ulcerates and encroaches on the passage, producing the very worst form of stricture. It embraces the gut—destroys its dilatability—presents an ulcerated surface to the contents of the canal. Hence arises extraordinary pain, grievously aggravated by the passing

of the motion; at last affecting the bladder by sympathy, and producing a necessity for the use of the catheter. At length the fæces are retained, the belly is tumid, the pulse intermits, there is hiccough, and all the symptoms which accompany the last stage of strangulated hernia.

Treatment.—We can only soothe by obtaining easy motions; by leeching the hemorrhoidal vessels; by fomenting, by anodyne clysters and ointments.

You foment by putting hay and poppies into the night-stool, and pouring boiling water on them: over this the patient sits, to promote the bleeding, or merely to soothe. The clyster is intended to remain, and should be thrown up at night; for example, cold-drawn lintseed oil, with a grain of opium; or starch, or tepid milk with vinum opii.

In the last stage of the disease, I have afforded much relief by using an ivory tube, which, passing through the ulcerated part of the canal, allowed the contents of the intestine to be poured off without the severe spasm and pain which disturb the bladder and urethra.

☞ In all severe complaints about the anus, remember the possibility of some indigestible matter lodging, and perhaps grasped, by the sphincter, as a bone or a pin; also recollect the case of "ball stool."

Obstruction higher in the Rectum.

In cases of obstinate constipation, there is a condition allied to stricture, which I do not find noticed.

The turn which the sigmoid flexure of the colon takes at the brim of the pelvis, is by straining pushed down upon the rectum; and the canal thereby takes so sudden a turn, that it is equivalent to a valve.

I have had no dissection of stricture high in the rectum, and believe this condition of the gut to be in reality what is called a high stricture of the gut.

But, in these cases, you must sound when the obstruction is out of reach of the finger; for which purpose you are to use an ivory or silver ball on the end of a strong wire or rod of whalebone; the rectum bougie being grasped by the anus, prevents you having the full use of it.

In sounding, or in introducing a bougie deep, you will not forget that the canal is a curve, and that many, by striking against the promontory of the sacrum, deceive themselves and patient with the notion of a stricture when there is no such thing.

The instrument is introduced for two inches direct, then pointed towards the sacrum; and if further introduced, it must be directed forwards towards the centre of the brim of the pelvis.

If dilatation of a stricture is to be attempted deep in the rectum, it had better be done by introducing an intestine and distending it.

It has puzzled many to comprehend what service the bougie does when there is no stricture. The fact is, that it acts as a suppository, and brings on an action in the bowels; and this is the reason why old ladies in a town in the south, submit to the operation, insisting on the advantage obtained through the bougie!

Hæmorrhoidal Tumours.

Hæmorrhoids are tumours which cluster round the anus, a consequence of irritation at the extremity of the gut.

Mariscæ are the tumours which come of old piles. (*Marisca*, a swollen fig. The term is in Juvenal.)

Piles are very frequent, and require management.

How ridiculous is the description of Baron Dupuytren! —The individual walks with pain in the street. We see him with his fingers at his fundament; or seating himself at the posts or curb-stones, in order to press back the swelling; or rubbing himself against the wall; all which gives but momentary relief. He is weakened by hæmorrhage—

pale exsanguined — falls into melancholy—becomes weak in faculties—finally, there is a scirrhous affection of the anus, and death! This is downright confusion and nonsense; a picture quite overcharged. The complaint is quite within your power to cure.

A pile results from distention of the veins of the anus. The distention produces inflammation, and the deposit of coagulable lymph around the vein; so that in time there is an excrescence organized, and with a distended vein within it. It presents a dark blue elastic tumour. The extremity of the vein bursts and bleeds. When first formed, the tumour is round, vascular, and painful; it fades, or becomes less painful. Another attack brings down or forms another pile; so that at length there is a cluster of them, generally with one more sensible than the others, and from which the distress and inconvenience principally proceeds, "the master pile." The more aggravated condition is when they enlarge so as to drag down the inner coat of the rectum, and become large and ulcerated.

There are internal and external piles; the internal consisting of dilated veins, the mouths of which open upon the interior of the gut, and bleed.

Constipation is the cause, but *purging* will not cure. Straining brings on the complaint, and encreases it.

Thus is stricture of the urethra often the forerunner of piles, because the stricture occasions straining to pass water; and often you will have some difficulty to determine whether the disorder of the anus arises from the state of the urethra, or the disturbed bladder from the piles. The sympathy of the parts is intimate.

Purging and tenesmus will produce piles, because of the relaxation of the sphincter, and the urging from above;

and thus the sphincter contracting spasmodically on the protruded part, distends the veins more.

It is in this way that you have to explain the occurrence of blood continually spurted against the night-stool or water-closet. The veins being beyond the sphincter, it closes on them, and forces the blood to burst forcibly from them.

Piles thus formed are attended with many unpleasant symptoms. There is great pain, from which they get their name, and a weakening discharge of blood. Their surfaces become ulcerated, and there is irritation, accompanied with swelling of the glands of the groin, pains in the sacrum, and down the thigh.

Treatment.—The cause being in the irregular condition of the digestion and discharges, these are to be first attended to, and mild laxatives and clysters so employed as to prevent all farther source of irritation. They are to be leeched and fomented if in a violent state of inflammation; and sometimes they are relieved by the point of the lancet. When in a lesser degree of inflammation, the ulcerated surface should be touched with a powder of nitrate of silver and gum-arabic, or touched with the painting brush and a solution of the caustic. Dipping a dossil of lint in a decoction of galls and laudanum, they are to be compressed gently, and kept reduced with this and a bandage.

But old confirmed piles with mariscæ must be taken away. When taken away, however, in patients of a certain age, and who have long had a habitual discharge of blood from the anus, there is some danger in their sudden suppression. Leeches to the

hæmorrhoidal vessels, and some change in diet, are implied. If piles have connection with disorder of liver, the course of treatment is suggested.

Some will cut them off at once, and no more ado. The inconvenience of this is, that after a day of professional labour, you are suddenly called up and told that your patient has fainted on going to stool, and has lost an extraordinary quantity of blood. Again, to avoid this, other surgeons tie the piles. Now, it happens that the skin of the anus being drawn in by the swelling of the tumour, the pain is excessive; and the bladder sympathising, the catheter is required.

Both these consequences may be easily avoided. Prepare the patient by clearing out the canal; let him have a lavement in the morning of the operation: a small irritable projecting pile may be cut off without ceremony, but a large pile with a broad base may be treated in this manner: Take a silver pin, a little longer than that used for harelip; take hold of the base of the tumour between the thumb and finger; pass the needle across the base of the pile; snip off the pile with the curved scissors, leaving the needle, and let the surface bleed, fomenting the while. This loss of blood is a great relief, and prevents inflammation. Take a soft ligature and put it round the needle, and draw it just to a degree to close the vein. This is for the purpose of preventing the great loss of blood which will sometimes attend a call to the water-closet. Next morning the silver pin or wire is withdrawn.

I was in the use of throwing up a few ounces of starch with twenty drops of laudanum after the operation, to keep the parts quiet for twelve hours. This is a mild and effectual mode of proceeding. But let us hear how M. Dupuytren proceeds. Of the application of the actual cautery, he says truly—"The cautery has something frightful to the spectator. I have seen you shudder at the red-hot iron and the smoke from the anus! Judge, then, what it must be to the friends in private—the parents not accustomed as you are to such pictures!" It is indeed a picture into which should be introduced the familiars of the Inquisition. We should suppose from this passage that he condemns the

practice; but, no—he is fortifying the minds of the eleves, and of our young gentlemen who go to the hospitals of Paris to learn the practice of surgery.

The internal pile requires some consideration.

There is a soft tumour which grows from within, and which may be treated with the ligature. This tumour, by coming down upon the anus, and irritating like the presence of matter, teazes; besides it bleeds, and keeps the person uncomfortable. The patient's bowels being cleared, you make him strain over warm water to bring down the tumour, when you pass the tenaculum across it, and throw a ligature over it; tie it firmly, and reduce it. This is not like the external pile in firmness, and there is no danger of the membrane of the gut being drawn in by the swelling of the tumor; it is generally as soft as a strawberry. If it be of any size, the needle may be passed through its base. The needle cut off, and two ligatures thus formed, they may be tied, the one on one side, the other on the other, of the base of the tumour.

When treated in this way, it will be proper to snip off the greater part of the tumour. By opening it or cutting it off, the danger of its remaining alive, notwithstanding the ligature, and swelling under its embrace, is removed.

These excrescences hardly deserve the name of tumour; they tend to no bad consequence when the cause of them, which is irritation, is taken away.

The French authority above quoted, after describing the pain and danger of the ligature, proceeds to advise the cutting off of the tumour, and the application of the actual cautery to hæmorrhoidal tumours.

"When the pile is external, the blood is thrown out-

wards; you see it, and easily stop it by the cautery. As to the internal, the symptoms declare the bleeding. (Pray observe what these *symptoms* are.) A sensation of heat in the belly, which mounts higher and higher in proportion as the blood accumulates and fills the intestine. Then he has colic pain, with a peculiar sensation, and tenesmus — there is especially pain in the flanks and iliac fossæ; the respiration becomes painful and cut (entercoupié); the pulse irregular, intermitting, small, and frequent; the skin discoloured, with a cold sweat, and in the face despair; followed by vomiting, convulsion, and vertigo!!!

Such is the condition described in Dupuytren's clinical lectures, of the patient in the case when the cautery has not been effectually applied. He has not the most distant conception of this being a disgrace to the profession of surgery. The quantity of blood lost in the operation amounts to three, four, or five pounds. It has filled the descending colon—the transverse—and the ascending colon to the cæcum; but it does not pass that. How do they know? By dissection!

I notice this because it is a consequence of those desperate operations, followed by hæmorrhage, which some surgeons conceived themselves authorized to perform, on a wrong principle, or rather on no principle at all.

Read the first case, p. 177, tome i., of the Leçons Orales of M. Dupuytren.

So some men, in imitation of such authorities, extirpate the anus!

I can only express my opinion: If there be diseases of a malignant nature, they cannot be extirpated; the surrounding parts and lymphatic glands are necessarily contaminated. If irritation and the action of the part have excited to excrescence and irregular thickening, partial excision, the removal of warty excrescences, followed by the obvious means of soothing the action and the surface, is the practice to be followed.

In bleeding from within the anus, you may use a clyster

of cold water. It is recommended to introduce a hog's bladder, and to stuff it with lint. In such cases, the bladder is not the best surface to be put in contact with a bleeding surface. Lay a piece of fine cloth, or a cambric handkerchief, over the anus, and push in dossils of lint until there is a bag within the sphincter thus filled. On drawing down the cloth, the vessel will be compressed. If this be not effectual, you must make the patient strain until the bleeding orifice is exposed, and use the common needle as formerly described, which is better than the actual cautery. Having a thread in the eye of the needle, it is easily withdrawn. A bit of bougie or of lint put upon the point of the needle prevents it pricking; but this is not necessary.

When danger arises after any severe operation on the rectum, what should alarm me? "Pain above the pubis, and towards the umbilicus; then fever, and peritoneal inflammation indicated by tenderness."

The question reminds me of warning you against the use of the *speculum ani*, or of forcing a large bougie into the rectum, for inflammation of the peritoneum results, and death. ☞ In operations on the rectum, there is less pain on injuring the gut within than at the margin; *but the danger of peritoneal* inflammation is greater the deeper the injury.

Prolapsus Ani.

The descent of the gut is frequent in children. It is not from fulness, as some have conceived, but from a peculiarity which you should observe for many reasons—an extreme irritability in the bowels of children. Sometimes ascarides will produce it; so will stone in the bladder. Often acidity and purging produce it.

I have seen, on dissection, in the course of the canal of an infant, three different portions of the canal in a state of

intus-susception. The prolapsus and intus-susception are nearly allied; both are consequent on local irritation.

In adults it is a more formidable complaint, and may pass on to complete strangulation. The pain becomes severe; the spasm uncontrollable; the portion already down, dark, and surcharged with blood, rolls out to a greater extent. The sphincter contracts upon this mass, and all the effects of strangulation are produced. There arises peritoneal inflammation, and the patient is lost.

In the child the case is more manageable. Let a sponge of the natural warmth of the body be held to the part. Oil your fingers: form a piece of paper into a conical form; soften its point, and oil it. You commence your operation by a general gentle and equable compression of the mass. You then introduce the part which came last down; and so carefully bit by bit you diminish its volume. You find that it is brought down by the withdrawing of the fingers. You therefore take the conical piece of paper, and applying it, you reduce the last portion. The cone slips easily away, without drawing the gut with it; and you hold the nates together, which keeps the bowel up. An anodyne clyster will soothe the part, and tend to prevent the bowel from being immediately thrust down again. Astringent lotions may be necessary; (and if ascarides have been the cause, injections to destroy them are to be used—aloes in milk, turpentine beat up with egg, weak solution of sulphate of iron, &c.) Probably the pulv. sodæ cum hydrarg. in small doses, with the infusion of cascarella, or of casparia with soda, will suit the disturbed condition of the intestinal canal.

In adults the care must be, by uniform pressure, to counteract the force from within. It is the escape from pressure, and the sudden extravasation into the cellular membrane of the inverted gut, that endangers strangulation.

I have had thoughts of dividing the sphincter in formidable cases.

There is an instrument for supporting the relaxed anus.

Fistula in Ano.

Whatever may be the cause of irritation in the rectum, piles, ulceration, stricture, or prolapsus, when inflammation exists within, there is danger of abscess in the cellular membrane external to the gut. The cause, however, is forgotten, and a painful swelling appears by the side of the anus, attended with pain in going to stool, and perhaps difficulty of passing urine.

Mild laxatives, clysters, leeches, and fomentation, are employed; but of all things, see that you use your lancet early, so that the matter may not burrow deep.

Consider the case, and distinguish between the abscess from inflammation of the urethra and that connected with the rectum.

In elderly gentlemen with exhausted constitution, the abscess may have little to do with the gut, and be of the nature of carbuncle; so far at least as to require especial attention to the constitution, as well as stimulating fomentations to the part.

Consider also the possibility of this abscess being "in the part and not of it;" that is, that, being of the nature of chronic abscess, the matter may have descended, and that you have to do with a lumbar abscess, instead of a suppuration from local irritation.

Such an abscess as we have described being opened, and the urgent symptoms relieved, becomes first

a sinus, and then a true fistula, that is, a sinus communicating with the rectum.

The abscess may have communicated with the rectum before opening externally on the integument; and it may remain for some time discharging pus as the stools are evacuated.

Thus systematic authors make distinctions into external, internal, and perfect fistula; meaning by the last term to indicate the case where there is both an internal and external opening.

Matters do not always remain thus, if the complaint be neglected; the contents of the rectum getting into the fistula, new inflammations, and consequent suppurations, are set up, attended with fever and great distress; and the buttocks may in this manner be quite undermined with sinuses, and these extending far from the anus.

In some constitutions the opening is extensive, and a pale striated ulceration is disclosed, quite indolent, and very difficult to excite into healthy action; and this, of course, is a result of an impoverished and exhausted constitution.

Treatment.—When a fistula in ano is of long standing, without much inflammation, and little distress, and the patient is delicate and subject to cough, do nothing with the idea of curing the disease; limit your attention to regulate the bowels, to free the rectum from accumulation of matter, and to soothe the parts. The rectum bougie may be regularly passed.

When the sinuses have run extensively under the integuments of the buttocks, do not attempt to cure at once, for the incisions may be too severe: but open the sinuses towards the gut, give freedom to the discharge there, and consolidate the remote passages. After this, when the complaint is in a manner limited to the simple though "perfect" fistula, perform the operation.

Introduce your probe, bending it and adapting it to the

sinuosities, until you think you must at least be touching the rectum. Then, having your finger oiled, introduce it into the rectum, and now endeavour to bring the point of the probe in contact with the finger. This, probably, you will not be able to do at once; but you feel that there is a very thin membrane only between the probe and the finger.

You seek for the communication between the fistula and the gut at the upper edge of the internal sphincter, and there it will be, if not superficial, and just within the margin of the external sphincter. Having found it, and passed the probe into the gut, the remaining process is easy. Pass the bistoury along the probe, rest the point upon the finger, and pressing the handle against the nates, give the point a direction outward, and bring out the finger and bistoury together, cutting the substance between the cavity of the canal and the cavity of the fistula.

If the object of laying the fistula and the canal into one be accomplished, little more is to be done; you lay a piece of oiled lint between the lips of the wound, and apply a warm sponge or fomentation.

This operation in woman requires other precautions; you must not divide the sphincter towards the vagina.

How high may the operator go with his incision of the rectum? It is needless to go higher than the sphincter, for it is the sphincter which prevents the fistula from healing.

When it appears that the connection between the fistula and gut is so deep that hæmorrhage might result, I advise you to use the ligature, in order to divide the higher part of the septum, and when this is done, to divide the margin of the anus with the bistoury.

The operation with the ligature is this: You take a leaden probe, with an eye carrying a firm waxed ligature; you pass the point of the probe in the manner described through the intricacies of the fistula, and into the gut; you pass your forefinger into the anus, and with the lith of the last joint you take hold of the end of the probe; you may be enabled to bring it out, or you only bend it, and afterwards seize it

with the forceps. Thus you draw through the ligature; then having had a compress prepared, you lay that on the integuments between the margin of the anus and the orifice of the fistula, and over the compress you tie your ligature with a slip knot. The intention of the slip knot is, that from time to time, as the ligature gets loose, it may be drawn tighter. The action of the ligature is upon the edge of the septum internally. Very gradually, by ulceration, it makes its way downwards, and happily the communication is filling up behind.

There is little inconvenience in this mode of operating, and no pain, till you come to draw it on the external skin; then there is pain and inflammation; and now, if the patient will permit the knife at all, with one motion of the bistoury the remaining integument is cut through.

The operation may be done with a leaden wire; twisting the wire instead of drawing the ligature from time to time.

Let the dressing be very simple; no stuffing.

Imperforate Anus.—A child is born imperfect in this part. Often there is no rectum, and the intestines terminate in a cul de sac. The child lives whilst this sac is acquiring extraordinary size, then dwindles and dies.

Sometimes the anus is formed; the sphincter is there, and the circle or margin sufficiently well marked. The rectum is entire, and the fæces filling it almost protrude the integument in this case. The *anus* may be perforated with advantage; but I have given up hopes when we have to search for the rectum.

I can only advise that the anus be perforated to the depth of three quarters of an inch, and the portion of an urethra bougie inserted. Ulceration, and the pressure from above, may do the rest. But if you succeed in procuring the evacuation of feculent matter, the child must have a miserable existence.

CHAPTER XX.

THE DISEASES OF THE URETHRA AND BLADDER, AND THE OPERATIONS PERFORMED FOR THEIR RELIEF.

[The author published a book on this subject, a second edition of which appeared in 1820; also plates in illustration of the morbid appearances of the urethra and bladder. He will endeavour to make it unnecessary for the reader to have reference to his former work. At the same time, notions then prevailed which he hopes he there successfully combated. The dangerous authority of Sir Everard Home universally prevailed.]

Before advancing to this department of practice, I entreat you to make yourself master of the relative position of the parts as seen in the section of the male pelvis; and that you trace the membrane of the urethra from one extremity to the other.

You may read Duran, Sharpe, Chopart, Desault, Hunter, Home, Whately, &c. &c.

Of Pain and Irritation felt in the Bladder, Urethra, and Perineum, not really seated there, but proceeding from disorder of the Bowels.

Those sympathetic pains which seem to affect the urinary organs, and which have their real seat in irritation of the rectum, or the other intestines, bring full one half of those patients to the surgeon, who are considered as labouring under stricture of the urethra. That this subject should make no part of those numerous treatises on stricture we possess, is to be explained only by supposing that experience follows, and does not precede, those publications. It is a fact that ought never to be

absent from the surgeon's consideration, when a patient presents himself, complaining of frequent micturition, pain in the bladder, and pain in the perineum, that these symptoms very frequently depend, neither on stone, nor stricture, nor inflammation, nor any mischief in these parts, but on remote irritation. If the practitioner does not carefully distinguish these cases, he will become a party to the patient's fears and misconceptions, and expose himself, in the end, to the supposition of being either very ignorant of the matter, or guilty of a still worse fault. Were it not owing to the remarkable neglect of nervous sympathies which prevails, indeed I may say, without reservation, were it not to be attributed to the neglect of this part of pathology, I should have cases, not of mistakes, but of selfishness and dishonesty to detail. The fact is simply this, that I have received patients, after having used bougies for months, nay years, who had no other complaint than an habitual disorder of their large intestines. There are two classes of gentlemen who will know how to appreciate these remarks: those who have had much experience in diseases of the viscera of the pelvis; and those who have attended my demonstrations of the nerves of the pelvis, the hips, loins, and thigh.

Therefore I conceive that the reader, having perused the many cases of long suffering from organic disease to be found in the course of the present work, must feel relieved, on knowing that our worst apprehensions from pain and spasm in the bladder and urethra, are very often occasioned by intestinal irritation, instead of stone or stricture. Mistakes about this matter continually occurring, and the distress of mind which they occasion, as well as the severe and hurtful practice which is too frequently the consequence, give it a strong claim upon our attention. At one time we find a patient living an indolent life, and thereby hurting his health, lest by a sudden motion he should displace a stone in his bladder; at another, irritation and strange feelings in the perineum lead the patient to believe that he has stricture. In the one case, the person is exhausted by the harassment of this imaginary evil, and his health disturbed by the confinement and want of exercise. In the other case, it is still worse, since the irritation in the urethra draws the patient to a surgeon; he introduces a bougie, and as this usually gives relief, it is repeated until some mischief is actually the consequence. Very often there is a slight abrasion of the membrane by the unskilful use of the bougie, which, were it not for

the frequent repetition, would soon heal; but by a perseverance in a wrong practice, it becomes the source of pain and discharge.

Mr A. returned from Bengal in June. He complained of pain and irritation at the neck of the bladder, and discharge from the urethra, heat in making urine, and a frequent call to void it. He shewed me various bougies, and a catheter which he had been in the habit of using regularly since the time of his embarkation. And he farther informed me, that the instrument was interrupted near what he supposed to be the neck of the bladder. On introducing one of his bougies, and in the manner in which he said he was in the habit of doing it, I found that it passed without obstruction along the whole of that part of the canal where stricture is usually found. But when, by calculation, the point had gone through the membranous part of the urethra, and was about to enter the neck of the bladder, it was entangled, and on pressing it forward it gave pain. I desisted that day; but on the succeeding one, taking a large wax bougie, and turning the point up, I passed it quite into the bladder. The extremity started over some obstruction; but when home into the bladder, it was not grasped: the obstruction was not therefore of the nature of stricture.

This gentleman having originally the symptoms of stricture in the urethra, had been treated with the bougie, and a lodgment made betwixt the cords which are around the caput gallinaginis; and hence arose a new source of uneasiness, and of inflammation and discharge.

Since this case was first published, I have had a very extraordinary confirmation of the truth of these remarks. After I had dismissed this gentleman, entirely relieved from his complaint, when travelling on the Continent, he was seized so suddenly with obstruction in the urethra, that he sought relief, and had the lunar caustic applied to his urethra several times. He wrote to me, expressing his gratitude to his surgeon; and that, still feeling uneasiness, he would return home, if I desired that he should. I recommended him by all means to continue his tour into Holland, and promised him, that when he returned home I would pass the largest bougie into his bladder, and satisfy him on that head. This was a bold promise, since caustic will make strictures where there are none. Some time after, he returned home. I passed a full-sized bougie into his bladder, without giving him pain. He was surprised; but what signifies the surprise, and of what value is the gratitude of one entirely

deceived by his own morbid sensations; who can make no estimation of his surgeon, whether he dismisses him honestly, or continues to attend him *kindly!*—Such cases are very common, and very provoking to witness. I had lately a young gentleman from the army of occupation, who had furnished his purse, obtained his leave, and engaged lodgings near me, and then presented himself to be cured, he said, of a confirmed stricture. He had long been exercising his ingenuity to destroy it, but finding that the symptoms did not abate, he came to town, resolved to sit down to a regular attack upon it. Somebody had given him a beginning, by hurting the membrane of the urethra, near the curve, with the end of the bougie, and he by successive injuries had prevented this breach healing. All that was required was to allow the parts rest, and to manage the bowels, which were the cause of the original irritation.

There is a certain class of patients, for which those surgeons who may not inaptly, however vulgarly, be said to have a run of business, find no time or patience: their complaints are called imaginary. The surgeon is vexed with the obscurity of symptoms, and with a long history in strong language, expressive of that distress which it is difficult to comprehend.

A patient came to me after having been under the care of four surgeons successively, for the cure of stricture in the urethra. I found his chief complaint to be an excessive tenderness in the perineum, so that as he walked across the room he lifted his leg with an awkward and straddling gait, afraid to bring his thighs together. He told me that he had commanded a corps of yeomanry cavalry, had been an active magistrate, and a great fox-hunter; but that for a long time he had not been able to mount a horse. He had been obliged to have the seat of his carriage made with a hole answering to his perineum, and had taken every precaution to prevent pressure against that part. I introduced a bougie into the urethra, but found no obstruction, nor any unusual tenderness in the passage. I examined him also per anum. It was remarkable, that, in putting him in the posture of lithotomy, and in fingering, kneading, and pressing the perineum, he was not sensible to pain, although, when he arose to walk, his progression was as before, in the same singularly cautious manner, betraying the utmost anxiety, that not even the clothes should touch the perineum. I was by this confirmed in my opinion, that it was a pain referable to the perineum, but not actually seated there. By attention to

the bowels, he was relieved, so as to resume his horse exercise, and venture into the country.

A professional gentleman suffered much uneasiness of mind from a pain in the bladder, accompanied with frequent desire to make water, and an increase of pain on voiding it. He took alarm about stone in the bladder, because the pain was especially severe when the bladder was empty. In the commencement of the attack he suffered indescribable irritation, extending over his whole body, and beginning at the lower part of the belly. It was with difficulty he could command his temper when in this state. These symptoms were particularly apt to come on when he lay down in bed; but he could not discover whether this was owing to the influence of the cold sheets upon his skin, to the change of posture, or the emptying of the bladder before going into bed. The first attack continued only during one day and night; but from time to time these disagreeable symptoms returned; and during their continuance he found it quite impossible to dismiss uneasy reflections from his mind. At length the pain became more severe and continued, but happily at the same time he was convinced that the whole depended on the state of his bowels. For being urged to consider, if there was not something in his diet which lodged and irritated the intestinal canal; his suspicion fell on a most preposterous indulgence in figs and Spanish white wine at supper, for several successive nights. By clearing out the canal, avoiding indigestible matters, and by the use of a mild laxative, the complaint entirely ceased. The singular circumstance here was the severity of the pain, apparently fixed and local, and the distinct sensation of tenderness in the neck of the bladder, although certainly there was no actual disease there.

I have frequently removed complaints falsely attributed to stricture, as well as the aggravation of the proper symptoms attending such obstructions, by dislodging scybalæ from the colon and rectum. There is an old patient of mine, who, when distressed in this manner with pain in making water, can ascertain, by his finger in ano, that it proceeds from hardened fæces there; and by a clyster of warm water and soap he removes the pain. To exhibit these symptoms in another point, I have prevailed on a patient to make his own statement: it is to the following effect:—

"The attack does not come on except when I am a little out of health, and when, by confinement to the house, the bowels

have become torpid. Though there be no pain before going to stool, still there is a certain sensation before sitting down, which warns me that I am to have an attack. It is after passing the fæces, that there is a sudden sensation of pain within the anus, and at the neck of the bladder. This is immediately followed by a pain, as of a sharp instrument driven from behind along the urethra, and giving the glans repeated darts. There follows this an intolerable spasm; being an attempt to pass more urine. These symptoms are not relieved until I bathe or foment all the parts thereabout with warm water. The attack not only returns on the occasion I have mentioned, but also frequently comes on when I am sitting in my chair; and even after I have been so well as to venture on horseback, it will come on suddenly, and with great violence. The principal distress, then, is lancing pains along the urethra, with great irritation of the bladder.

"Considering this as inflammation of the bladder, I abstained from wine, until one day being in a large company, and suffering very severely, I in despair took several glasses of port wine, which not only soothed me at this time, but made me much better the next day. After this, I found myself always better on taking a few glasses of port wine. Purges increased the irritation. The medicine which has done me the most good is the balsam of copaiba, which acts as a gentle laxative. Though quickly removed by attention to the bowels, the attack is very apt to return."

When thinking of this subject, I had a visit of an old patient, who is occasionally disturbed in nearly the same manner. But in him were contrasted the disease actually seated in these parts, and the sympathetic affection from irritation of the intestinal canal. Some years ago, being in Ireland, he had a gonorrhœa, and during the inflammatory stage his surgeon used a large bougie to remove the discharge. To this treatment he attributed an excess of suffering and inflammation in the neck of the bladder, which kept him long on his back. When he came over here, he still complained of pain in making water, and had a frequent desire to void it; and especially the pain was great in discharging the last drops of urine. On account of these symptoms, I was called in to sound him for the stone. He had very naturally great dread of this operation; for he thought it must occasion a return of all his sufferings. No stone was felt.

Next visit I examined the prostate, and found it enlarged on one side, and painful to the touch.

For the removal of these symptoms he took a pill of cicuta and calomel every night; every three days he had leeches applied to the verge of the anus, and rubbed upon the anterior part of the rectum an ointment with camphor and mercury: and as the bougie was found to relieve the distressing symptoms, it was introduced for ten minutes twice a-week. Under this treatment he got rapidly better, and the more formidable train of symptoms never returned. These complaints were indeed in contrast with others, in themselves sufficiently distressing. There came upon him, from time to time, a pain at the lower part of the belly, and behind the pubes, attended with great irritation in his bladder, with spasms, and a stinging along the urethra. These I traced to irregularities of diet, and to the congestion of matter in his bowels. In conversation he observed, "that abroad we were not accustomed to sit after dinner as you do here, which if I am constrained to do, this irritation comes on; and if I ask a lady to drink wine, the wine is no sooner in my stomach, than the irritation of my bladder commences: if I am long confined to the room, it rises to a dreadful degree of annoyance; but if I am free to leave the company, especially if I mount my horse, which I am in the habit of doing abroad, I prevent its occurrence, or am presently relieved, if it has begun." This gentleman was at length cured of all his complaints by due attention to his bowels.

But this is not the whole of the case. Since the last publication of these remarks, this gentleman being at Paris, introduced himself to M. Cullerier, to have a thorough search for a stone in his bladder. That gentleman sounded him, and turned him about in all manner of postures, but found no stone. After a mission of two years in a foreign country, he came again under my care. And I shall venture to predict, that whenever out of health, or with derangement in the bowels, he will have his old apprehensions; for, when actually suffering this kind of irritation, it is impossible for the patient to dismiss his fears.

Such are among the most common occurrences in general practice. They are in themselves trifling complaints, but in their consequences very serious, from the mistakes into which they lead the surgeon; and the patient, in these circumstances, is always ready of belief.

I have affirmed, that there never occurs a proper stricture,

posterior to the internal fascia of the perineum. But the inflammation to which the parts behind are peculiarly exposed, very often gives rise to symptoms which are readily attributed to stricture—these parts are *Cowper's gland*, the *Sinus pocularis*, the *Prostate gland*, and the *Vesiculæ seminales*. There are men whose hourly business is poking into this passage with bougies, who, if they have heard the names, know neither the place nor diseases of these parts, and sometimes, by forcing what they consider a stricture, they rupture the membrane, and enter their instrument into the substance of the prostate, or fix it in the sinus of the seminal caruncle.

Col. G. returned from India with health very much impaired, and with symptoms of what he thought stricture in the urethra. He went to a surgeon, who told him that he had only a very slight stricture, and that he would destroy it by one introduction of the bougie. He introduced a large wax bougie: it gave exquisite pain, and when withdrawn, it was doubled at the point; and the blood came out in jets from the end of the urethra. After this operation, the patient had no rest for many months. He next went to a surgeon, who also treated him with bougies, and under whom he was nearly two years.

When the time of his return to India drew near, he became excessively anxious, for still the introduction of the bougie was thought necessary; and every time it was introduced, with whatever degree of care, it drew blood. At this time I sounded him, and passed a large bougie along the whole urethra without giving him pain; but when the extremity of the instrument was pushed through the prostate gland, and over the seminal caruncle, there was an insufferable pain excited, and he became very faint. It was evident that he had no stricture. On further questioning him as to the size of the bougie, and the marks which might have been upon it on former trials, he told me the bougies had always been brought out as easily as this last one, and without any mark upon them. As the bougies had always been brought out easily, and without being grasped, although it appeared that they had remained long in the passage, and as they had exhibited no nip nor mark of stricture, I could not resist the belief that there never had been a stricture, although he had been treated for it upwards of two years! I need not add that I put this patient upon a very different plan. It was my object to soothe the complaint of the viscera to which he was subject, to attend to the secretions from the intestines, and to see that they

were in due quantity, for his liver was out of order; and in the mean time, to relieve the inflammation of the neck of the bladder from the injury it had suffered from the frequent and needless introduction of bougies.

This gentleman, on a voyage from Madras to China, passed a large fish-hook from his rectum!! he could not tell how it came there.

By disturbance in the bowels, a train of symptoms are produced which are attributed to disease of the urethra. It requires the patient to have a strong mind, or very implicit confidence in his surgeon, to be enabled to dismiss his apprehensions of stone or stricture.

How those sympathies take place which give rise to these consequences, it were quite needless to attempt explaining, unless my reader had accompanied me in the demonstration of the visceral nerves. It is sufficient for practical purposes, at present, to observe, that there is not only a sympathy betwixt the bladder and the other parts contained within the pelvis, by which the diseases of the one may be mistaken for those of the other; but certain parts of the intestinal canal through its whole extent, sometimes the stomach, sometimes the ileon, often the colon, and still oftener the rectum, being the seat of irritation, will produce sensations in the bladder, the perineum, or urethra. These will fill the mind of the sufferer with the most serious apprehensions, and lay him open to the mistakes of ignorance. With regard to the external pains which accompany these internal irritations, they will in general be attended with a sort of scalding or sensation of heat upon the skin; and if the patient be capable of attending to the circumstance, the pain will be found to correspond to the progress of indigested food or acrid matter along the canal. The pain, for example, will often precede the call to stool, and be relieved as soon as a different sensation is experienced.

What I have done in these cases is soon told—to enter fully into the subject would be to usurp the physician's province.

The violent operation of purgatives is to be avoided. The combination of laxatives is better: thus, after emptying the canal, with the oleum ricini and tinctura sennæ, preserve the intestinal surface in activity by combinations of ipecacuanha, pulvis rhei, and pulvis cretæ cum opio; or a combination of the pulvis antimonialis with the pulvis rhei, and the extractum pa-

paveris albi; or, it may be, that it will suit better to give the electuarium sennæ with sulphur, or sharpened by the addition of jalap and oleum ricini. It may be necessary to combine opium with the oleum ricini, when there is much pain and spasm, or to add hyoscyamus to a pill of soap and extract of colocynth. Superior to all, in some constitutions, is a tea-spoonful or two tea-spoonfuls of the balsam of copaiba taken at night. When by such means the canal is disposed to a gentle action, let the morning evacuation be assisted by a larger clyster of warm water. Very often, in these conditions of the viscera, there is only something wrong in the diet, and the symptoms will vanish by avoiding what harbours and is offensive. We shall find it often impossible to restore to the bowels their permanent healthy action, without stirring up the liver to its office. What I have found of most advantage, is a pill at night of three grains of the pil. hydrargyri, and two grains of the compound extract of colocynth, and in the morning the patient may take a very small portion of neutral salts in solution, so as still to avoid purging, but only gently and regularly to move the intestines, or the carbonate of soda and tartrite of soda in a state of effervescence with the citric acid.

If mistakes have been committed with instruments, it will be well to apply leeches to the verge of the anus, and soothe by bathing and fomentations, by drinking mucilaginous decoctions, or by taking occasionally a mucilaginous electuary, or a tea-spoonful of Hoffman's anodyne in almond emulsion.

Clysters of warm water, during the paroxysm, are very soothing, and go directly to the seat of the irritation. The clyster of cold water is often advantageous. The anodyne clyster of starch, or milk with tincture of opium, or the opiate suppository, will naturally be suggested in the violence of the paroxysm. But a regulated diet, air, and exercise, are here, as in many complaints, the most natural, the most obvious, and the best means of cure.

The Cases which require the Catheter, and of the introduction of the Catheter.

In paraplegia, and in fracture of the spine, the urine is retained in the bladder; there is no power of expelling it.

You will be told of some undefined influence of nerves withdrawn, which makes a change upon the secretion, and causes the urine to become irritating to the bladder. This is fancy; there is no power over the secreting organs withdrawn by division of nerves. Let me remind you that the patient has no sensibility in this case in the passage: The more occasion have you to be careful in using an instrument. Although he feels not yet the injury done with the catheter, it brings on mucous secretion, and inflammation and fever, just as certainly as if, by your awkwardness, you had made your patient cry!

In these cases of paralysis, the bladder becomes surcharged, and then the urine drains off. But inflammation may notwithstanding arise from the distention.

Whatever disturbs the muscles which surround the neck of the bladder, stops the action of the detrusor vesicæ, and the urine is as effectually retained as if some mechanical obstruction existed.

Thus, 1. operations on the rectum; 2. a kick or a fall on the perineum; 3. fracture of the os pubis; 4. extravasation of blood; inflammation of urethra, &c. are attended with distention of the bladder.

Thus, too, in the case of gonorrhœa, when that inflammation is propagated backward to the sinus urethræ, it happens that the acrid urine stimulates this portion of the urethra; the ejaculator seminis which surrounds it is excited, the urine is squirted out in painful jets; and presently the other sphincter muscles sympathise; they are spasmodically affected, and the muscular coat of the bladder (their natural opponent) ceases to act, and there is complete obstruction.

So it happens, that when by any circumstance the bladder becomes inordinately distended, the urine ceases to flow until at length it dribbles away, and the patient believes that he has an incontinence of urine instead of obstruction. This is the case of *stillicidium urinæ*. So it occurs that a man with a full bladder, being long detained by false

modesty, when relieved from restraint, cannot pass a drop of urine! See the case by old Ambrose Paré, of the young bachelor who had his mistress on horseback behind him. So the famous Tycho Brahe in Hildanus.

The most unequivocal example is in woman; although in her the muscles be fewer, yet there is the same relation in them for expelling and for retaining the urine; and when these relations are disturbed, the urine is retained in the bladder—*e. g.* a woman being in labour, and the child's head pressing the urethra, and the labour in this stage delayed, when at length delivery is accomplished the bladder refuses to act! The case being misunderstood, and the woman's condition neglected when the practitioner returns, he feels the abdomen distended, and the bladder filling it as the uterus did before!

I state these cases in the beginning, that you may comprehend how easily the muscular apparatus round the urethra and neck of the bladder is disturbed, and that *spasm* enters into every case of obstruction more or less, whether the case be stricture, prostate disease, or injury.

This over-distention of the bladder is a case for the use of the catheter; and when the bladder is relieved, you perceive that the urine will accumulate again to the same extent, unless it be regularly drawn off, and time afforded for the detrusor urinæ to recover its tone and action.

What will be the consequence of neglect in such a case? I have repeatedly seen the patient suffering little, and in ignorance of his condition, with the bladder distended to such a degree that it reached the umbilicus. But in younger subjects, and in general, it is a state of great danger, attended with pain and fever, with a urinous and ammoniacal smell, and hiccough. When the bladder has been powerfully muscular, the case is worse, and the coats may give way, so that the urine escapes into the abdomen. See Stricture.

The bladder, however, does not burst. The term is inapplicable, as we shall see.

I have mentioned inflammation, as in gonorrhœa, producing this distention; and I again call your attention to it, because you should not use the catheter

here without positive necessity. Let your patient be bled, leeched, the bowels opened by laxatives, and let him have a good dose of opium and the warm bath; and by such means endeavour to relieve the spasm. But when you see one dancing round your room in agony, and the bladder has not emptied itself for twelve or twenty-four hours, and *you have reason to believe* there is no stricture, you cannot refuse the assistance of the catheter.

But again, since we are considering the effect of disturbed action of the muscles, suppose the suffering patient has come into this state, and you learn that he has been under treatment for stricture, the catheter cannot be used without danger of disappointment, and indeed of aggravating the symptoms. It is in this case we relieve by

Drawing the Urine off by the Simple Bougie.—Take the wax bougie; soften it at the point by dipping it in warm water; give it the proper curve; oil it. Now the patient standing with his back to the wall, or resting on his knees in the bed, you introduce the bougie down to the stricture. You hold it there, gently pressing it. The soft end moulds itself into the stricture perhaps: it is not necessary to the effect that it should. He is now to make an effort to pass urine. You persuade him to it: you dash the end of a towel dipped in cold water on his thighs. He thinks he could make water if the bougie were away. You withdraw it slowly; and after it the urine flows in a stream!

Many is the time that I have done this, when the most desperate remedies were in contemplation.

This failing, and the case urgent, we must have recourse to a slender catheter, an instrument to be avoided if possible.

Operation of the Catheter.—In selecting an instrument, bougie or catheter, to introduce into the bladder, take the largest that will pass freely, and without giving pain in passing through the orifice. For the orifice is naturally the narrowest part of the canal; and the large round extremity of the catheter will pass over the lacunæ and other impediments, when a smaller instrument will hitch into some of the natural impediments.

Lay the catheter in a basin of warm water; place the patient with his back to the wall, resting; dip the catheter in oil, and introduce it with the concavity towards the pubis.

In time you will come to prefer introducing it with the convexity towards the pubis; but this implies a turn of the instrument as you pass the point under the arch of the pubis. Some will affect to make this *tour de maitre* with great skill, when, in truth, it has nothing to do with the real difficulty of the operation.

If the patient is lying horizontally, you rest the hand on the haunch, and draw up the penis to the point of the instrument; and let me say, that in whatever way the catheter be introduced, the penis should be stretched, as if it were drawn on the instrument, instead of the instrument being pushed in!

I have witnessed with pain the surgeon introduce the catheter with one hand; a vanity which should receive a school-boy's punishment.

Be careful in passing the instrument through that part of the urethra which is braced up to the bones of the pubis by a ligament. This is a narrow part of the urethra, and just before it, is the largest and most dilateable part, the *sinus urethræ*. Just, there-

fore, as you depress the handle of the instrument that it may pass under the arch, you encounter this difficulty. See then that the point does not swerve from the centre, and that it be carried in a gentle curve. If you meet any difficulty, lay the three fingers of the left hand on the perineum, and draw the integuments forward; and thus let the points of the fingers be as a fulcrum, so that on depressing the right hand the point of the instrument is raised.

If the point of the catheter has passed the ligament of the urethra, it enters what has been called the membranous part; and then it may hitch against the fore part of the prostate gland, a part somewhat restricted by a fascia. Here the instrument should be carried bodily forwards, not in the curve.

If difficulty be here encountered, the finger must be introduced into the anus, by which the point may be directed, and the parts drawn towards you, by which the interruption to the point will be removed.

It is possible that the point may be caught within the prostate, and just as it should enter the bladder. Violence here may lift the inner membrane of the bladder.

In using a small pointed instrument, the end may enter the *sinus pocularis*, which gives great pain, and brings on swelled testicle.

☞ A variety of catheters, silver of different curves and lengths, and elastic gum catheters preserved in proper curves, are to be desired in the surgeon's cabinet.

Of Diseases in the Prostate Gland.

The student of surgery has his most important lesson to get from the dead body. He should examine the outside and neck of the bladder,—the place of the entrance of the ureter,—the relation of the vesiculæ seminales and prostate gland,—the distance of the prostate from the anus. He

may consider how these parts should feel with his finger in ano in the living body. He should open the bladder, and pass his probe along the mucous membrane, thinking of the possibility of natural obstruction to instruments, and the place of diseased obstruction.

What is commonly meant by diseased prostate gland, does not occur in young men. But the prostate may become inflamed, and abscess may form in it and around it, in youth—than which there are few more distressing complaints.

It results from what is called Suppressed Gonorrhœa in a scrofulous constitution. When the urine gets access to these suppurations about the prostate gland and vesiculæ seminales, they may destroy the patient with fever and irritation, and an incessant call to urine.

In addition to the common means taken to support the constitution, and to soothe the local irritation, I have seen great benefit from washing the passages by means of the catheter and syringe. You contrive that the stream shall gently play from the side hole of the catheter into the sinuses.

When the ducts of the prostate are enlarged, and when abscess opens into the passage, be very careful in using the catheter that the point does not get entangled. You might in that case, without much seeming violence, carry the instrument between the bladder and the rectum.

The prostate gland, as we advance to mature years and in old age, becomes subject to disease. The patient is often sensible of a fulness of more than usual irritation, and of some hesitation in commencing to make water. But very often he comes to you with obstruction of urine, and with no conception of the cause. He is in pain from distention, and you feel an unnatural fulness above the pubis. You must relieve him. In twelve hours the bladder is again distended, and he requires the catheter twice a-day for some time. Gradually the bladder recovers. You do not see your patient perhaps for three months; at least till

you had forgotten the circumstance, when he appears again and precisely in the same condition.

But your patient, as I have hinted, comes to you in a different mood and with different symptoms. He thinks he has got incontinence of urine; it dribbles away continually. But his age and history make you put your hand upon his abdomen, and you find a circumscribed tumour above the pubis. He is very unwilling to believe that the bladder is distended, and much surprised he is when the catheter is introduced, and he finds the chamber-pot filling and not done yet!

The prostate gland is subject to various diseases; a simple scirrhous enlargement, a varicose condition, and more malignant softer tumour.

The varicose state that attends some kinds of enlargement of this body, is followed with very distressing symptoms. These veins burst and discharge blood freely into the bladder, so that it coagulates there and obstructs the flow of urine.

When you find *bloody urine*, you anxiously inquire into the source of it. Is it from the kidney? Is it from stone in the bladder? Is it from priapism? Is it from the prostate or the cavity of the bladder?

I would have you treat hæmorrhage from the prostate gland as an internal hæmorrhage, or as you would a woman threatened with miscarriage. Avoid using the catheter if possible. When you use it you will find it stopped up with coagulum, and you will have to inject a very little tepid water before you will be able to relieve the bladder either of blood or urine.

As the urine flows into the bladder, the coagulum dissolves, and the urine is for a long time charged with blood. At length it is clear, and the patient

remains well for an indefinite time, until a shock in riding, or a plethora of the gland, causes the veins to burst out again.

The prostate becoming enlarged, swells unequally. On examining per ano you may feel it large and soft, or indurated more on one side; or you may feel it moderately enlarged, and yet attended with obstruction of urine; that is, when it is enlarged in what has been termed the third lobe of the prostate. This is the *Uvula Vesicæ* of old authors, a projecting tumour from the posterior and deepest part of the prostate into the bladder, and which rises like a valve, falling before the stream of urine to obstruct its egress.

The uvula vesicæ is attended with peculiar symptoms, which were well explained by Sir Everard Home. The patient conceives that he empties his bladder entirely, because on straining he forces out the urine. The reason is this: The bladder is over distended, but by the action of the abdominal muscles, the fundus being pressed, that part which lies on the bladder is distended, and by its distention it drags down the uvula, opening a passage for the urine as long as the strain continues. In this manner is the patient deceived, and he will not be undeceived until on introducing the catheter, he fills the chamber-pot with urine.

The introduction of the catheter in the case of diseased prostate gland, ought to be an operation of delicacy. Petit and Desault are indifferent to the breaking of the membrane, nay, an idea prevails that it is good to unload the varicose vessels! There cannot be a greater mistake. Abrasion of the surface of the diseased prostate fills the bladder with blood, and lays the foundation of ulcer and fetid discharge, and increase of irritation.

When you use the catheter in the case of diseased pro-

state, you may presume that the greater swelling of the gland is under the urethra, and therefore that that canal is raised.

In which case it is obvious that when the point of the catheter has arrived in the membranous part of the canal, you depress the hand to raise the point, that it may surmount the obstruction beneath.

It is for the same reason that the elastic gum catheter is used, which, requiring less guidance (and, indeed, from its elasticity admitting of less), by accommodating itself to the irregularity of the passage, glides past the obstruction.

You understand why a full-sized instrument is used, that a small point striking against a sudden turn of the urethra (such as must be the consequence of any inequality in the tumour of the prostate) is apt to injure the membrane and lodge.

If you find obstruction here, do not continue to press the instrument (as Desault recommended, and others following him), under the false notion of subduing the swelling of varicose veins! But introduce the finger into the rectum, feel both the point of your catheter and the prostate, and directed by the finger, carry the instrument higher and in the proper line.

When this is neglected, the point, as I have said, lodges, and there is much blood; and on every succeeding attempt the instrument falls into the part where there is already a lodgement made, and it becomes exceedingly difficult, sometimes impossible, to relieve the bladder by the catheter.

When the prostate gland is generally and greatly enlarged, a longer catheter than that usually made use of is required, in order that it may pass through the gland into the bladder.

I made a dissection (the preparation is in the College of Surgeons), where the catheter had been used, and, as the surgeon supposed, passed home. The point, however, did

not pass into the cavity of the bladder, and the patient died of distended bladder!

When the diseased prostate gland takes the form of *uvula*, you should place the patient reclining backwards, that the tumour may fall back, or at least be more easily pushed off from the urethra.

The use of the catheter, in some conditions of the prostate, may be required for years, and with no farther inconvenience than the necessity of drawing off the urine twice a-day. This, however, becomes, a grievous tax upon both surgeon and patient, and the patient must be taught to relieve himself.

In other cases, it may become a question whether or not there may not be a better prospect of ultimate cure, by keeping the elastic catheter in the bladder, and strictly enjoining rest in a horizontal posture.

As to the farther treatment of the disease of the prostate, 1. Guard against lodgement in the rectum by the use of clysters; 2. Apply leeches to the hæmorrhoidal vessels; 3. Mild laxatives; 4. The tepid bath; 5. A pill with conium and pil. Hydrargi, or soap and opium, or Dover's powder,—the bowels the while kept open by castor-oil and manna, sulphur, and confection of senna.

Before treating of stricture in the urethra, one or two hints on the treatment of gonorrhœa may be necessary, since the sequel of that inflammation is so frequently the cause of stricture.

Insist on abstinence from butcher-meat and wine; keep your patient in the horizontal posture; open the bowels smartly with a purge, in which the tartarized antimony is an ingredient; drink plentifully of barley-water, with gum-

Arabic, or make for him a pleasant electuary with gums. Soothe the irritation by Dover's powder. Apply as a lotion equal parts of the camphor mixture, aqua ammoniæ acetata and rose-water to the penis.

℞. Confec. Sennæ.
Pulv. Cubeb.
Bals. Copaiba.
Syrupi. q. s. ut ft. electuarium molle. Let him take the size of a nut three times a-day.

Many surgeons declaim against injections, and they have reason, after permitting their patients to use them, as I see injections prescribed; that is, without precaution of any kind, by which they must reach the irritable part of the urethra and neck of the bladder!

The seat of the specific inflammation of gonorrhœa is within less than three inches from the extremity of the penis. Consider also that an injection is of no service, unless it distends the membrane of the urethra, and you will see the necessity of the following precaution.

"When you inject, compress the urethra with the ring finger of your left hand, anterior to the scrotum, against the bone, so that not a drop of the injection shall pass beyond; and if you feel it pass, desist. Take a bit of thick soft leather, and cut it of the size of a shilling; bore a hole in the centre, and put the nozel of the syringe through it, and so you may put on a second and a third. These are to prevent you passing the pipe of the syringe too far into the inflamed urethra, and to prevent the injection coming back."

By these precautions the injection is made to fill and distend the urethra, and so it ought to be kept for three minutes, and used thus three or four times a-day. A proper injection thus used can do no harm, and a mild astringent injection thus used will do more to the cure of the disease than all the stimulating and acrid injections that you see in books. The following is a good injection:

℞. Zinci sulphatis, gr. vi.
Solve in aqu. ferv. ℥iiss.
℞. Liquoris plumbi subacetatis, gtt. xii.
Aquæ ferventis, ℥iiss.

Misce solutiones et fiat injectio.

The mischief arises from a young man concealing his condition, and thinking himself obliged to eat, and drink wine, and ride, &c.

The chordee is caused by erection when the membrane of the urethra is already inflamed, and has consequently lost its elasticity. Being powerfully stretched, it cracks, and you have hæmorrhage. It is obvious that if you do not subdue this, you lay the foundation of strictures.

When there is priapism and chordee, you should insist on bleeding and leeches and fomentation, for the inflammation is running backwards to the sinus of the urethra. Wholesome discipline now may save the patient from a multitude of evils; or what is still worse, abscess by the side of the prostate gland and vesiculæ seminales.

When there is great pain and frequent calls to make water, inflammation of the bladder is imminent, and requires the most active measures. General bleeding, leeches, laxatives, the warm-bath, anodyne clysters, camphor and opium, and afterwards the uva ursi, with carbonate of soda, &c.

The consequences of gonorrhœa most to be dreaded are, inflammation of the bladder, inflammation of the vesiculæ seminales, and abscess at the neck of the bladder, partial inflammation of a chronic kind in spots of the urethra, gleet, and strictures,—a catalogue sufficient to put a young man on his guard, and to make him submissive.

The gleety discharge, if not corrected, is certainly the forerunner of stricture. If there be inflammation, it must be subdued; if little inflammation, the use of the simple bougie may be had recourse to.

The canal should be put gently on the stretch, after which the discharge will increase, and then happily subside altogether. The gleet continuing in a relaxed and perhaps strumous constitution, tonics may be taken.

℞. Aqua puræ . . ℥x.
Spirit. Cinnamomi.
Syrupi, . . ā ā ℥i.
Tinct. Ferri Muriat. gtt. xx.

Ft. Haustus, 6 horis sumendus.

The Irritable Bladder.

Children have often an irritable bladder, which makes them pass water when in sleep,—a great distress to the poor things themselves and those about them.

A similar condition of bladder in young men is attended with great shame and restraint. I have known young men of twenty-one who dared not sleep from home, and who, on visiting, have been obliged to sit up all night, lest they should disgrace themselves.

A nurse tied a cord about a child's penis, to prevent it wetting the bed, and the cord cut into the urethra!

I have known young men treated with bougies for months on account of this irritability, and put under a mercurial course, the invariable resource of ignorance.

There may be a formidable case of irritable bladder, and you must discover the cause,—probably disease of the rectum or disordered action in the bowels. It may be morbid secretion from the kidney and sympathy with that gland. These are to be thought of, and the cause ascertained.

But there is another circumstance not unworthy of consideration. The position of the child in bed should be attended to. When we lie on the back the urine gravitates to that sensible part of the bladder on which the action of the muscles depend. The sensible spot on the interior of the bladder, just below and posterior to the opening into the urethra, commands the muscles at the neck of the bladder as infallibly as the sensibility of the glottis controls

the muscles of respiration. When that spot is irritated you are forced to make water!

> If you order that the nurse shall lay the child on its cheek, inclining it to lie on the stomach or the side, there will be no call to urine,—no wetting of the bed. On giving this rule to older patients, they have found it infallible; so much so, that they would start up the moment they were sensible that they had turned on their back, knowing the consequence.

When the bladder has contracted a habit of action, the patient should be recommended to measure the quantity of urine which he makes, and accustom the bladder to retain more by little and little. It is in this case that the injection of the bladder is of advantage. The bladder receiving as much tepid water as the patient is in the habit of evacuating at one time, will retain it until a double quantity of water is accumulated. And in this way the bladder may be dilated so as to resume its natural condition of action.

This washing of the bladder is also of use when there is irritability from the accumulations of mucus from the prostate.

OF STRICTURE IN THE URETHRA.

When I asserted, and to the unbiassed in judgment proved, that the membrane of the urethra was not muscular, Home and his immediate pupils sneered at the doctrine. Nor is it to be wondered at that they should, as it overturned much of their opinions and practice. The membrane of the urethra is a mucous membrane, and there is no instance of such

a membrane being muscular. The fibres are always exterior, and in the urethra there are enough of exterior muscles to account for the symptoms attributed to the contraction of the stricture.

It is very easy to persuade a patient, when he has a stricture, that the occasional obstruction to the discharge of the urine arises from spasm in it; and especially when, after any little irregularity, he is unable to pass his urine, and feels a girding and pain in the seat of the stricture; and when he finds that the surgeon cannot introduce a bougie, he attributes these indirect effects to a spasmodic state of the stricture. If he is relieved by the warm bath, opium, and other antispasmodic medicines, he is then convinced that he has a stricture, which is occasionally spasmodic.

But the patient is deceived, and, what is of more consequence, the surgeon is also in an error; for it can be shewn, that this spasm is not in the stricture itself, but that it is a spasmodic action of the muscles surrounding the urethra.

A stricture in the urethra is an effect of inflammation, which destroys the fine elasticity of the membrane. We have the whole extent of the urethra sometimes thus affected. But the common stricture results from a chronic inflammation which affects a small part, a sequel of more general action.

If you take one of my urethra probes (which is a little silver ball on the end of a wire), and pass it into the canal, you will find, especially after gonorrhœa, that there are sensible spots over which the ball passes with pain, and intervals of the membrane between these spots which have no morbid sensibility. These inflamed portions of the urethra are the commencement of strictures.

The *Dilateable Stricture* is when the point of the bougie meets with obstruction, and where, at the point of obstruction, there is exquisite sensibility. By continuing the pressure, the instrument at length passes. In this way a large bougie is made to pass, and the patient is led to believe that he has no stricture,—neither has he,—but if this inflamed spot be permitted to remain, he will come back to you, after some months, with a confirmed stricture, *i. e.* with an obstruction that does not yield to any reasonable pressure with the bougie.

Desault is of opinion, that stricture is a consequence of ulcer in the urethra. This opinion prevailed, but it is not correct; although, undoubtedly, an abrasion with instruments and consequent ulceration, will produce stricture, which is a reason against that boldness and false shew of dexterity which I have had so often to condemn.

Stricture sometimes forms in the orifice, it may anywhere in the canal, but most frequently it forms near the bulb. And there is a reason for this; it is the most irritable part of the urethra, where the inflammation consequent on gonorrhœa lingers longest.

A simple stricture, that is, one which has formed without interference of the surgeon, is a dense filament, not always directly across the canal, but when it is so situated, corresponding exactly with the description of Mr Hunter; and its effect on a wax bougie is precisely as if a thread had been drawn in a knot upon it.

A stricture, however, is very seldom found thus simple; for the stricture opposing resistance to the flow of urine, an inflammation is kept up, which produces a farther thickening; and very often the use of instruments has farther increased the disturbance, causing an irregular thickening.

This disturbance may amount to irregularities in the whole course of the urethra.

Behind the stricture inflammation is kept up by the push of urine. Often this produces a deposit of coagulable lymph there; and as we shall have occasion to notice, sometimes the membrane ulcerates immediately behind the stricture.

Until we consult the dissected body, we shall form no correct idea of the consequences of strictures.

Behind the stricture the urethra is enlarged. If there has been much suffering, coagulable lymph is thrown out, and the lacunæ are enlarged, and the sides of the canal become irregular.

The consequence of this is, that the surgeon having overcome the stricture, finds the point of his bougie or catheter entangled, and he has great difficulty in passing the instrument into the bladder. But these irregularities are removed in time, if the stricture be cured.

The part of the urethra embraced by the prostate gland is dilated, and the ducts of the gland very much widened; there the point of the catheter is apt to lodge.

In a confirmed narrow stricture the bladder is much contracted, and its coats thickened, and the muscular coat is particularly strong. In the worst cases, coagulable lymph hangs from the interior surface of the bladder, and if the patient has been cut off by an accession of inflammation, the fundus exteriorly is loaded with dark blood.

This contraction of the bladder is the consequence of frequent and long continued action. But we find when the attack has been sudden that the bladder is greatly distended. The ureters are frequently much distended, and

the pelvis of the kidney, shewing that they also suffer in stricture; and it is when they are affected thus, and the secretion of the kidney impeded, that great irritation and fever and effusion on the brain takes place.

Symptoms of Stricture.

The symptoms are these: 1. Frequent call to make water. He rises in the night time to relieve the bladder. 2. The urine does not flow readily, — it passes off involuntarily when he thinks he has made water. 3. It passes in a feeble divided stream. 4. There is some discharge. He is subject to chills like the attacks of an ague.

Treatment.—The contracted orifice of the urethra must be treated by gentle dilatation with the short silver or metallic bougie. Violence produces reaction; slitting the orifice is not advisable; the caustic is useless.

The stricture of the orifice is very often attended with great distress, and sometimes with abscess in the perineum.

Sir Everard Home put the whole profession wrong in the matter of the treatment of stricture by the publication of innumerable cases treated by means of the lunar caustic. The caustic is to be reserved for very particular cases.

Let it be your care not to make a breach in the membrane of the urethra. The natural membrane is elastic. When you destroy this natural mucous membrane, you substitute a portion of dense cellular membrane and new coagulated lymph. As long as the bougie is used, this substitute for the natu-

ral membrane serves its purpose, but it ever has a disposition to become more and more dense and inelastic, and so the stricture forms again! The patient, consequently, is never independent of his surgeon; that is, he must be in the occasional use of bougies. This is a great evil.

So it happens that when Sir E. Home convinced his patients that there could be no permanent cure without *burning* the stricture, and when he succeeded in making a slough, he insured the return of the stricture.

The permanent cure of stricture is to be accomplished by dilatation; not sudden dilatation, but such a stretching of the narrow part of the canal that it *grows* large under the operation, and has no disposition to contract, the natural membrane resuming its texture and office.

Use of the Wax Bougie.—Much is to be accomplished by the simple wax bougie. In introducing a bougie, give it the proper form, let it cool to have some degree of stiffness; and in introducing see that you humour the form of the bougie to the turn of the urethra.

We see the bougie very properly turned up at the point, so as to pass easily; but in introducing it the softened wax is made straight, and the point hitches on the narrow part of the canal behind the sinus.

When you have difficulty in passing the stricture, use all gently. Take a bougie, oil it, dip the point into warm water, so as to make it quite soft. Introduce it down to the stricture, press it gently for half a minute. On withdrawing it, you have a cast of the stricture, and if you have taken care to preserve the relation of the bougie to the urethra, you see the size of the stricture, and to what side the passage inclines.

Now, taking a small bougie—one adapted to the diameter of the stricture as impressed on the mould—you give

the point an inclination, so that in introducing it, it shall avoid the filament which obstructs, and fall into the right direction.

The bougie being introduced into the stricture for ten minutes every second morning, the stricture relaxes. You very gradually increase the size of the bougie. The more gradual the dilatation, the more permanent the effect. Having passed a bougie of the full size, you prepare for leaving it off. You pass it twice a-week; once a-week; once a-month; and after some time the patient returns to see that the cure is complete.

By the use of the *elastic gum catheter*, a narrow stricture may be dilated in the course of three days. You introduce the catheter to-day, and on the morrow the urine passes by the side of the instrument; you pass a larger instrument. It is at first held, but in twelve or twenty-four hours, it is loose in the passage, and you may introduce the largest size.

But the stricture is not cured! in eight days the canal is again restricted. Here is the proof that you must do a little at a time, if you expect the advantage gained to be permanent; and you must leave off the use of instruments very gradually.

The caustic (nitrate of silver) was used by Mr Hunter only in the case of stricture so complete that no instrument could be passed into it. I have had patients so old as to have submitted to the method in practice before the time of Hunter. They destroyed the stricture by "ulceration." This they contrived by the use of the bougie. Their bougie had some elasticity. They introduced it into the urethra, making the point bear upon the stricture. They then tied the bougie to the glans penis. The patient bore this until the point of the instrument excited ulceration in the stricture, when the point went through. But this was a most dangerous mode of proceeding, and you perceive what often happened, the formation of a false passage. Such, how-

ever, was the operation for which John Hunter substituted the caustic. It was Sir Everard Home who, making the profession believe that he was pursuing the "principles" of Mr Hunter, introduced the universal practice.

The "armed bougie" is a wax bougie, opened at the end to let in a piece of the lunar caustic, which by this means is introduced down to the stricture.

In using the caustic bougie, we proceed in this manner: We take a bougie of the common kind, adapted to the urethra, but the extremity of which will not pass the stricture. We take a caustic bougie of the same size and form; we then give both of them the proper bend to answer to the place of the stricture; we then oil them, and lay them by us, for, if kept in the hand, they lose their firmness. Then taking the glans penis in the fingers, the simple bougie is introduced with a uniform motion, until it meets the stricture. Having ascertained that the point bears against the stricture, a mark is made with the nail on the bougie, that the depth of its insertion may be ascertained. It is now to be withdrawn. The simple and the armed bougie are now placed together, and a mark with a nail made on the armed bougie corresponding to the place of that on the simple bougie. The armed or caustic bougie is now introduced with a uniform motion of the wrist and fingers, until it is opposed by the stricture: it is gently pressed, and a steady gentle pressure is to be continued for the space of a minute.

In the application of the caustic bougie to an old and confirmed stricture, there is often no pain experienced; and the pain and heat in such a case are the effect of the liquefaction of the caustic. Where there is a small bridle stricture, the bougie, as commonly prepared, must permit the caustic to touch some part of the natural surface, and there will be a burning sensation accompanying the application.

When the bougie is withdrawn, a soft white matter covers the surface of the caustic. This is not a slough, but is the effect of the caustic coagulating the natural secretion of the passage. This concreted matter sometimes remains in the passage until driven out by the urine. The patient is ever willing to believe this the slough of the stricture.

The proper slough generally comes away in small shreds with the urine. After a very severe application, at the distance of perhaps three days, the patient feels an unusual obstruction in the passage, and straining, he brings away the slough.

When I wrote the volume on Stricture, I had given up that severity in the application of the caustic, which produces distinct slough and temporary obstruction to the urine; and I am now well convinced, that in the case adapted for the use of the caustic, a slight application, that is, a short continuance of the application compared with what was then practised.

Mr Whatley introduced the use of the *kali purum*. He broke it into very small pieces, and picking a portion of the size of a pin head, he made a hole for it in the wax bougie, inserted it there, and by this means passed it down to the stricture.

It did not destroy the firm stricture, but it removed the irritability; it had also the advantage of making a soap with the secretion of the canal, and thereby facilitating the introduction of the bougie. It was a safer, and a milder practice than that of Home.

Forcing the Stricture

Is a most dangerous practice. A catheter with a conical point is used. It is forced through the obstruction, and remains in the bladder. It seduces you, because you do at once by a dexterous hand what others may be slowly attaining through patience and many operations. Be aware of the danger—which is, that you force the point into the spongy body of the urethra, or the substance of the prostate gland.

Suppose a patient is under treatment for stricture, and that on a sudden there is total suppression. The

bladder is distended with intolerable pain. The means of bringing on a flow of urine is used—bleeding, laxatives, the warm bath, opiates. They fail. There appears a necessity of puncturing the bladder. Instead of which, the surgeon determines to pass the catheter, and he may succeed if the stricture be simple. He certainly will not if the stricture has been made firm by many attacks of inflammation. He forces on the catheter—he feels it tear up the texture—blood flows copiously, but no urine! The patient's case is infinitely worse.

If it is to be accomplished, it is thus: Let the patient be supported in the erect posture—sit down before him—pass the catheter down to the stricture—keep it there gently pressing—be sure that you are in the line of the urethra—withdraw the instrument to feel if it has entered the stricture—at last it resists the little tug to withdraw it—it must then be in the stricture, for when the point is out of the natural canal it is never held. Being sure that the point has entered, you carry it steadily onward, and happily the urine flows!

Keep the catheter in, and put him to bed with an opiate.

Piercing the Stricture.

In my early practice I cut the stricture, and have to be thankful that I saw my error without fatal consequences, and gave the practice up. The practice has been renewed in London. I had two or three illustrative cases admitted into the hospital. You will find the practice in the French authors Chopart

and Desault, under the term *sondes à dard*, and reasons sufficient against the practice.

RUPTURE OF THE BLADDER.

When the bladder is distended, it does not rend like a dead bladder; it is not burst.

When the bladder has risen suddenly above the pubis, and perhaps to the navel, there is great danger, not that it shall burst, but that it shall ulcerate, for I believe that is the more correct term.

I have had several cases of actual bursting of the bladder, and the preparations are in the museum of the College of Surgeons. But they occurred in consequence of falls when the bladder was full. When the distended bladder gives way without external violence, we find on dissection one or two small black ragged holes—the bladder flaccid—and the urine in the cavity of the abdomen!

The symptoms of such a calamity is the fever increasing to delirium, and the disappearance of the hard tumour of the bladder without evacuation of urine by the penis.

But this is not the manner in which a patient with stricture generally dies. He is worn out with fatigue and sleeplessness. The bladder, as I have said, becomes thickened in its coats, diminished in its capacity. He is on his knees, straining every half hour, until worn out with exertion, pain, and fever. His countenance is haggard and wild; he becomes incoherent; his respiration is hurried, and so he dies.

You perceive, then, that in this most common case of all, he dies of obstruction of urine, and yet the bladder is empty! perhaps not containing an ounce of urine.

How the Bladder is to be relieved in case of Total Obstruction.

I have punctured the bladder in three different modes, and of late years I have rejected them all for the following method of relieving the bladder. It is a manner of operating to be pursued whether the bladder be distended, or whether the patient be suffering from contracted bladder and incessant pains to make water.

The operation is done on these assumptions—a stricture in the urethra never takes place further back than the posterior part of the bulb. Behind the stricture, the urethra is always remarkably enlarged.

Place the patient on the table, as for the operation of lithotomy, only that there is no occasion for tying him; the operation is neither a painful nor a protracted one. Put a catheter or a sound down to the stricture, and give it to an assistant; introduce your finger into the rectum and feel the prostate. Thus prepared, take a sharp-pointed bistoury, slightly curved—plunge it into the perineum, just anterior to the anus—carry it towards the face of the prostate. The finger is in the gut—the knife is carried in the outside of the gut. When the point has arrived at the prostate, the hand is to be depressed, and the point thrust into the urethra. It is to be brought out, cutting along the membranous part of the urethra, and at the same time in a manner to open the integuments of the perineum largely. The

urine spouts from the incision, and the patient feels instant relief.

The patient from this moment being safe, and freed without that torturing dissection which we have seen so long practised of cutting into the stricture, you may put him to bed, or finish the operation. I prefer seeing him recruited before I proceed farther.

You may destroy the stricture at your leisure (because there is now no danger to the bladder), and having passed the catheter through the stricture, you direct it into the bladder, a matter of no difficulty. The parts are healed over the catheter. There is no greater triumph of art than a cure thus conducted.

Puncture of the Bladder from the Rectum.

The position of the patient is on his back, the perineum presented, and the assistants holding the thighs apart. The oiled finger is passed into the rectum, the distended bladder felt. The long trochar suited for this operation (the point of the stilette being withdrawn within the canula), is passed along the finger and within the gut; directed by the finger, you press it against the distended bladder—then pushing forward the stilette, you pierce the bladder. You are careful, in carrying on the instrument, to remember the axis of the pelvis, and to direct the point towards the centre of the brim by depressing the hand.

See that in feeling your way with the finger in ano, you sufficiently distinguish the parts. When you pass the finger

into the rectum, and turn it up beyond the inner margin of the sphincter, you ought to feel the prostate. You must push your finger beyond that, to feel the more elastic fulness of the bladder. You are now made sensible that, if the prostate gland be enlarged, you cannot reach the bladder, and that this is no operation for obstruction of urine from diseased prostate.

I have seen the surgeon fail in this operation; and, on dissection, I found that he had run the trochar into the body of the enlarged prostate, having mistaken it for the bladder!

I have also found on dissection the vesiculæ seminales pierced with the trochar!

I have succeeded better by directing the instrument into the bladder by the side of the prostate rather than behind it. But it is essentially a bad operation.

When the bladder is relieved, introduce an elastic gum catheter through the silver canula, and withdraw the latter. When we consider the substance between the bladder and rectum, it is surprising that, on the catheter being pushed out (which it will be during the action of the bowels, unless much attention be paid), the urine passes by the rectum until the stricture be relieved.

The Operation above the Pubis.

The bladder may be punctured above the pubis, but the bladder must be distended, and have risen high to make this operation practicable. By the rising of the bladder, the peritoneum is pushed up, and the reflection of that membrane is so far raised, that a space is left between the os pubis and the reflection, where the trochar may pierce without transfixing the peritoneum. The patient is placed reclining backwards with pillows under his loins; an incision

is made just above the pubis, first through the integuments and then through the linea alba, sufficient to let the finger feel the distended bladder. Into the bladder he thrusts the long trochar, with its concave side towards the pubis; he directs the point a little downwards, towards the centre of the brim of the pelvis. On withdrawing the stilette of the instrument, the urine flows at first with force—by-and-by with a diminished stream.

The reason of making an incision before puncturing the bladder, is to prevent the infiltration of the urine into the cellular membrane behind the pubis, and between that and the peritoneum, to give free outlet to the urine if it should escape from the bladder.

And in general it does escape and do mischief; for whether the canula be left, or an elastic catheter introduced through the canula—whether the operator stop when the tension of the bladder is moderately relieved—or whether he draw off the whole urine,—the misery is that urine does escape, and produces slough of the cellular membrane behind the os pubis, and consequent irritation and fever.

In all cases, unless it be where the prostate gland is enlarged, and where total obstruction has been brought on by the catheter lodging in the gland, the operation which I have described of cutting into the urethra is to be preferred.

Besides, let it be remembered, that the patient may be dying of obstruction of urine, and yet the bladder at no time contain an ounce of urine! In them, and they are by far the most frequent cases, you cannot puncture the bladder. But by opening the urethra behind the stricture, the bladder begins gradually to relax, and to admit more and more urine to accumulate. The happy consequence of this is, that the patient not only makes urine early, but

has longer intervals of rest to recruit his exhausted powers.

It is always valuable to obtain an insight into the reasons of action of sensible men, such as Mr Hunter and Mr Cline.

Mr Hunter finding his patient retching and hiccoughing, and the distended bladder risen to the navel, and the abdomen tender—and his efforts being ineffectual to pass an instrument by the urethra, he punctured the bladder above the pubis.

Here, then, are the circumstances in which Mr Hunter preferred an operation which would give immediate relief, and which would, at least in the first instance, be attended with no disturbance to the constitution,—an operation which he himself had projected and executed.—*See Mr Hunter's own edition of the Treatise on the Venereal Disease.*

In that operation, as I have seen it performed by our best surgeons, and the pupils of Mr Hunter, it is tedious, and there is much dissection and fingering for the instrument; the incision is large and deep, and the constitutional powers cannot stand this protracted interference.—*See Society for the Improvement of Surgical Knowledge*, vol. ii. 353.

I have heard men say, "I never puncture the bladder." Very good—but what then? what is your substitute? I acknowledge that, if an intelligent surgeon has the whole management of a case, he may have to boast that he never punctures the bladder. But the surgeon of an hospital, or a consulting surgeon, is not in this situation: A poor creature, after long suffering, has total obstruction, and withal, is in that nervous irritable condition in which he

will hardly let you approach him; what is to be done must be done quickly; no protracted operation will be permitted. I have told you how I have proceeded in using the bistoury in the perineum, and I believe it to be the best mode of proceeding, but I can still foresee the case in which the puncture of the bladder is the instant and only resource.

In the volume to which I have last referred, there are three cases which I would have you to read for a different purpose. They are by Sir Everard Home. They are instances of that very improper use of the caustic bougie, which in his hands was doing great mischief—and, by imitation all over England, incalculable harm.

He is at length obliged to puncture the bladder, which he does by the rectum: the quantity of urine evacuated is four ounces.

I would have you, as anatomists, to say—what are the hazards of the operation when the bladder is dilated only to this extent? It is the case in which the operation I have described ought to be performed.

RUPTURE OF THE URETHRA AND FISTULA IN PERINEO.

When the strictured patient has a burning in the perineum, with a sensation of fulness, and strains to make a few drops of urine, he is in danger of extravasation of urine. The ulcer in the urethra behind the stricture is about to give way.

This state is very frequent after the improper use of the bougie.

The patient, straining hard, feels that the bladder is emptying itself; but no urine flows! It passes into the scrotum; and to the dismay of the patient, the scrotum first, and then the penis, is enormously distended.

If he be not immediately relieved by incision, a black spot appears on the scrotum, and the urine may extend the integuments of the pubis and groin!

If he still be neglected, the scrotum sloughs,—the countenance changes—the pulse becomes feeble—the stomach sympathizes, he is sick, has hiccough, and sinks.

The anatomist understands what has taken place; the urethra, weakened by ulceration, has burst under the impulse of urine. The urine has got into the cellular membrane; but instead of making a swelling exactly at the place of rupture, the perineal fascia has directed it forwards into the loose texture of the scrotum.

In a good constitution, and in youth, nature, after sad ravages, will sometimes relieve herself; the whole scrotum sloughs off, leaving the testicles hanging bare; and, more strange to say, I have seen granulations form, and a new scrotum involve and cover these parts!

Treatment.—A timid, or rather an imperfectly educated surgeon, is satisfied, on seeing the scrotum thus distended, with putting his lancet into the swelling, and letting the urine drain off. You must use your bistoury, and open the scrotum below, and carry it backwards, so as not only to let the extravasated urine out, but to give freedom to that which must follow from the breach in the urethra.

You may, in addition, puncture the fore part of the scrotum, and the penis, if necessary.

Do not mistake the swollen prepuce and œdematous pe-

nis, the consequence of inflammation and a too bold use of instruments in the urethra, for a case of rupture.

For the rest, the parts must be fomented; the irritation subdued by opiates; the strength supported; and the stricture removed.

Urinary Abscess.

In the preceding division of our subject, we considered the effect of the membrane of the urethra being inflamed to ulceration, by which the urine burst out. In the case of abscess, the urine does not first burst out. Still the matter of the abscess is a consequence of inflammation within the canal. Sometimes the inflammation of gonorrhœa will produce it; or the inflammation of Cowper's gland; and most commonly it is caused by improper interference with the bougie.

The bougie, properly used, diminishes irritation, and subdues spasm; but used recklessly, and too often, it produces swelled testicle, and abscess. The abscess is frequently the consequence of bougies being put into the patients' hands, who, though at first they are timid enough, become at length too bold, and the inflammation in the canal is increased.

The patient complains of heat, throbbing, and swelling in the perineum: and on examination a swelling and hardness is felt, which increases and extends towards the anus.

When the parts are in this state, the means of reducing the inflammation are in vain pursued. It may at once suppurate and open. But generally the muscles at the neck of the bladder are deranged in action. The pressure of the matter, too, on the urethra causes difficulty of passing urine, or total obstruction.

The abscess must be opened, and the earlier the

better. The pus forms here very quickly. Use the abscess lancet freely. The matter spouts out to a distance, and the bladder is relieved. At first there is no urine, but afterwards urinous smell in the dressing shews you that, if the urethra was not open in the beginning, now it is.

The *practice* at this stage will be to soothe the urethra, and to proceed very slowly with the dilatation of the stricture, if that has been the cause.

> *E. g.*—Fomentations and poultice to the part, after you are confident that the evacuation of urine and matter is free; laxatives; mucilaginous drinks, and opiates; laudanum, æther, and liquor potassæ, in camphor mixture; the pill saponis cum opio, &c.

This abscess degenerates into *fistula in perineo*, if the cause be not removed; that cause being stricture with inflammation in the urethra. The exterior orifice of the abscess contracts; the urine lodges, and causes other abscesses; they open and discharge. Again, there is succession of chills and fever, and new abscesses, until the perineum, scrotum, and neighbourhood of the anus, become irregularly hard and swollen, with fistula remaining in different directions.

In the mean time the stricture is no longer simple. Coagulable lymph is deposited around it; the canal of the urethra is compressed and distorted by the external swellings; and the patient's condition is altogether most distressing, with fever and increasing irritability.

The *operation* is a difficult one. If you can remove the stricture, all does well; the openings close, and the hardness is subdued, and the parts resume

their original softness and texture. But too often this object is not to be so easily attained. The stricture is callous and irregular, and the canal so twisted that an instrument cannot be passed; and the caustic aggravates symptoms and makes no progress.

The Operation.—You will have by you catheters, probes, bougie, a syringe, with the instruments of the pocket-case. The patient is placed in the position as for lithotomy. A catheter or sound is introduced into the urethra, down to the stricture. As to probing the fistulæ, they are irregular, and the probe in this stage is useless.

The incision must be a decided cut in the direction of the raphe, designed to lay bare the urethra. But considering the state of the parts, that they are dense with repeated inflammations, you can hardly expect to make a dissection to lay aside the parts, and to disclose the bulb. The whole mass is of one consistence, and dense.

Directed to the place of stricture by the point of the catheter, you divide it, and you pass the point of your bistoury from it in a direction backwards, to lay open the canal behind the stricture.

Having found the passage, you may pass on the catheter into the bladder, and the operation is finished.

It is very often difficult to find the urethra behind the stricture; and of all things remember that a protracted dissection here is most dangerous. For the patient being in a miserable state, exhausted by long suffering and extravasation of urine, and a succession of abscesses, to be kept long on the table in addition to all,—this is death!

Therefore if, after a fair attempt to find the urethra, you

are disappointed, pass the finger into the rectum—feel for the prostate—look well to the centre of the body—and pass your sharp-pointed bistoury in, anterior to the prostate, and cut towards you in the line of the urethra.

This must relieve the bladder; and putting the patient to bed, with a large opiate, you wait your time.

When I have succeeded in finding the urethra behind the stricture, I have, when the patient was reduced by previous long suffering, been satisfied with passing a short elastic gum catheter into the bladder; and deferred passing the catheter until the fever and distress were diminished.

When the catheter is passed, the parts heal by granulation over it; and the final success will depend on the way in which the urethra has been treated. If you have passed the catheter through the stricture into the urethra behind it, the cure will be permanent. But if you have brought the catheter out anterior to the stricture, and in again into the incision of the urethra behind, the patient may be satisfied, and the cure apparently quite satisfactory; but he is destined to require the use of bougies for the rest of his life, and is in perpetual danger of relapse.

OF THE PREPUCE, PHIMOSIS, AND PARAPHIMOSIS.

The prepuce is in some rare instances imperforate at birth. Sometimes the orifice which should correspond with the urethra is exceedingly small. I relieved a little boy who made urine in great pain. He was held in his father's arms, crying piteously, while he made water. The prepuce was distended like a bladder, and from it a hardly perceptible stream of urine jetted from a small hole. I cut it up with the point of the bistoury, and the little man pissed and laughed!

You must read Petit on this subject; Traité des Maladies Chirurgicales. You will be rewarded by some curious sto-

ries. But practically there is more in this matter than will be found in books.

The prepuce is narrow in different degrees, so as to produce a train of very various symptoms, some of them unexpected.

In the greater degree the glans is not uncovered. If the urine passes from the urethra in such a way as to circulate under the foreskin, no bad consequences may follow till the child is grown up. But then it happens that the secretion of the glans of the corona is confined, and gives rise to inflammation and discharge.

An injection of milk and water, or a weak solution of zinc, will relieve this, and prepare the part for the operation.

The tightness of the prepuce may be in that degree, that, being drawn back, it may not easily return: in that case it forms *paraphimosis*, and strangulates the glans; being attended not only with great pain, but with retention of urine. This condition, too, has its obvious remedy.

But the tightness being in a lesser degree, the effects are often more agonizing. A concealed band or ligament is in the reflected margin of the foreskin. It permits the glans to be uncovered. But during erection it constricts the penis behind the glans, throws back the seminal discharge, and produces agony.

There is another condition most severe on a Benedict. The narrow prepuce gets inflamed by this distention. It becomes chopped, and little wounds like ulcers form around it. In priapism they are

torn open with great suffering, and continence or an operation are the alternatives.

Gonorrhœa in a narrow prepuce causes great disorder. The presence and irritation of the matter produces warts of the glans and interior of the prepuce, and at the same time much discharge. There is altogether a great mass; and this mass, when disclosed by cutting up the foreskin, assumes an alarming appearance; the extremity of the penis being like a cauliflower.

Sometimes the suppuration within, and the narrowness of the prepuce, cause ulceration on the side, through which the glans at length protrudes. Thus the appearance is very peculiar, so that repeatedly it has been taken for cancer; and I have known amputation of the penis performed under this impression, when all that was necessary was to slit up the distorted prepuce, and to destroy these innocent warts, the product of mere irritation.

The Operation.—(Do not attempt to remedy the natural phimosis by dilatation; and do not, if it be possible to avoid it, make incision of the prepuce when in an inflamed state, and especially when the patient is affected with mercury.)

In the natural or congenital phimosis, do not cut up the whole prepuce, but putting in your probe, and elevating the edge, you feel that the tightness is in the very margin; put a little bit of wax off a bougie upon the point of the sharp-pointed bistoury. Introduce the point thus guarded under the prepuce; push the point (regardless of the wax) through the inner fold of the skin, and bring it out through the mar-

gin. You continue to cut more of the inner fold than of the outer skin. You draw the foreskin over the glans, to see that the stricture is effectually relieved.

I see by the observations of some authors that they have either seen this done awkwardly, or have done it so: for they say, "that it leaves two flaps!" It certainly will, if you cut up the whole prepuce; but this is never necessary in the congenital phimosis.

The operation may be done with two incisions; that is to say, instead of one longer incision, the bistoury may be used on the right and left margin; when, if the patient studies appearances, he may be assured that there will appear nothing of the operation in one condition or another of the penis.

If it be necessary to open the prepuce largely, then an appearance rather alarming is presented to the patient; for when, after the incision, the foreskin is drawn back, it appears as if the whole penis were flayed and left bloody. This is owing to the separation of the two layers of which the foreskin is composed; and in this case it may be necessary to stick them together at the angle by a single thread.

This incision will probably divide the vein, and afterwards, especially if he becomes alarmed, the patient may lose much blood. Put him therefore on his guard, or use the needle so as to prevent it.

There is *another operation*, which is circumcision. You take between the finger and thumb of the left hand, the firm ring of ligament which is the evil to be removed, and you make the patient at the same time draw the integument against you. Passing the

sharp double-edged knife through close to your grasp, the whole margin is cut off by one movement of the hand.

The Jew draws the extremity of the foreskin through a slit in a silver plate, and cuts it off.

When there is a hardness of the anterior part of the prepuce, the circular incision will be best. But observe, that if you are not careful to draw back the natural and elastic integument before cutting, you will disclose a large bloody surface.

Adhesion of the Prepuce to the Glans.

I must presume that it is want of cleanliness that causes an inflammation of the back part and interior of the prepuce to the corona glandis. The adhesion gradually advances on the glans. It requires a nice dissection to separate it from the corona, and much care on the part of the patient to prevent it from reuniting. I have dissected clean, and touched it with the brush and caustic lotion.

Paraphimosis.—When a boy has drawn back his prepuce and cannot return it, pain and distention, and the strangulation of the parts, are the consequence. If the inflammation be not very great, you compress the glans with your thumb, while with the fore and middle finger you draw forward the integuments. But this is a most painful operation, and something more must be done.

The integuments will be found much swoln anterior to the stricture, and the stricture deep, so that it is difficult to get the probe or directory under it.

In this, however, you will probably succeed; and when this is done, it is easy to introduce the sharp-pointed bistoury, and to cut outwards.

If this cannot be done, you must penetrate the skin behind the stricture, and pass the probe or fine directory forwards under the stricture, and then divide.

We are told that the firm covering of the corpus cavernosum penis has been penetrated. This must have been from inexcusable awkwardness.

To be sure, if you cut until you can reduce the glans, you may go very deep. Be satisfied with recovering the stricture. The parts will in the end resume their natural appearance and looseness.

DIVISION III.

OF THE GREAT OPERATIONS.

CHAPTER XX.

OF AMPUTATION.

We must proceed on the supposition, that it is determined to lose the limb to save the life. For to pretend, in a preliminary discourse, to decide upon the cases for amputation, would be to take in review all the important questions which have been discussed, under compound fracture, wounded arteries, caries, white swelling, gunshot wounds, and tumours! It would be about as wise as prefacing a book of surgery with a description of the anatomy.

We are informed that amputation was anciently performed by cutting at once to the bone, and sawing the bone through. It might have been done, but certainly not a second time by any sagacious operator. Because he must have seen, on the very first occasion, that by the wasting of the skin, and the projection of the bone, the cure was delayed, and the stump a bad one.

The truth is, then, that they always retracted the skin, and forced up the muscles, so as to cut through the bone as high as possible. There are some things so obvious that men cannot miss them—and this is one of them.

An amputation is well performed when these objects are attained:—1. The skin so cut that it shall cover the muscles. 2. The muscles covering and

concealing the end of the bone. 3. The bone sunk deep, with all its periosteum about it. But besides these, there are other very important circumstances which innovators forget—the ligature of the arteries, and the condition of the nerves.

This latter point I consider as by much the most essential; for the pain of nerves engaged in the cicatrix of the stump, is beyond all the most severe, and not only prevents the use of an artificial leg, but disorders the whole system, and entails a variety of nervous complaints.

Of the Circular Amputation above the Knee.

Apparatus.—You look around, as you ought in all the principal operations, to see that every thing is prepared. Will you believe that the late Mr Lynn, of the Westminster Hospital, on putting out his hand for the saw found there was none! and they had to send to the joiner. That, on another occasion, in tapping a woman, the foolish assistant gave him the stilette, and kept twisting the canula between his fingers, which was not discovered until the surgeon had plunged the instrument into the woman's side! Recollect what befel a good man, that on operating for the stone, and having made his incision, there were no forceps—no, nor within twenty miles of the place. From that time the gentleman resigned his profession, and all men pitied him.

Therefore, I say, trust no man when you are about to operate. On this occasion, have these—compress and bandage, tornequet, amputating knife, saw, bone forceps, tenaculums, small forceps, split cloth, strapping, compress for the face of the stump, and Malta cross or some substitute for it, dressing, rollers, sponges, basins, cold and hot water, wine and water, bed prepared; appoint your assistants or friends to

their duties, and let a young gentleman sit low and steady the leg. The roller is around the loins of the patient, and pinned up.

The Tornequet.—You place the compress, with its attached roller, on the femoral artery, and in passing round a bandage to fix it, see that you do not make this too tight.

> If you do, the operator is disconcerted in taking up the vessels on the face of the stump. For when the arteries are tied, and the tornequet loose, still blood is poured out. It is the bandage which you had put on, and which now compresses the veins.

Where the compress is, as in this case, on the fore-part of the thigh, the tornequet may be put directly on it. See that the strap is strong, that the buckle does not interfere, and that the power is not exhausted if the operator require you to screw tighter. See that, before the operation is begun, the whole is slack, and the circulation free. For by having the tornequet tight, to such a degree as to stop the return of the blood by the veins, you fill the limb with blood, and the patient loses more than is necessary. You will know when this is done, by the blood jetting from the veins on the first touch of the knife.

Most surgeons make a simple circular incision through the integuments. I always inclined the amputating knife, so as to make two semicircles, one on the inside, the other on the outside, of the thigh, but without raising the knife; it is done in a moment.

Now, let the assistant draw back these integu

ments, whilst you repeatedly touch with the knife the cellular connections with the fascia. You make no dissection; without that your assistant finds no difficulty in holding or in folding them back.

I care little about the fascia, but if the integument be not well drawn back before the fascia is divided, the nerves which take their course in close connection with it are left too long.

You set on the knife close to the retracted margin of the skin, and carry round the knife at once to the bone.

☞ The pupil who has sat holding the leg now rises, and raises the limb so that the thigh-bone is perpendicular. You touch with your knife as the muscles withdraw themselves from the bone, especially on the back part, and at the linea aspera.

[☞ If you at this juncture take a general view of the parts cut, you ought to see, towards the leg, the skin retracted off the fascia, and the muscles projecting, and about two inches of the bone bare. This being the exactly opposite state of the section towards the body, exhibits a proper condition of the divided parts.]

The assistant throws over the split cloth, puts a slip on each side of the bone, twists it below, and retracts the muscles so as to keep them off the motion of the saw.

The surgeon should not cut off the periosteum from the bone. In sawing the bone, the saw is to move horizontally.

This is to prevent what infallibly happens, when it is held steadily by the assistant as he sits on his stool. As the saw passes through, he holds the limb up, and that interrupts the saw; he draws it down, and that splinters the bone.

When the amputation is thus performed, and

when you bring down the stump, the bone has disappeared entirely among the muscles; you see it no more, unless you again raise the stump to the perpendicular. When you bring the integuments over the muscles, they fall together neatly, their edges exactly corresponding, and without the slightest pucker or irregularity. This is the perfection of the operation of amputation, done by two or three motions of the hand! and with incomparable advantages in the after treatment.

The Arteries.—Without undoing the tornequet, the arteries are secured. You find the femoral artery on the inside of the bone: see that you draw it fairly out of its sheath, and distinguish it from the vein which is nearer the bone. Then you seek the great descending arches of the profunda: the one on the outside, the other towards the inside of the face of the muscles, recollecting to seek for the larger branches in the interstices of the muscles, not in their substance. I advise you to use a ligature of three threads for the main artery, of two threads for the lesser arteries. Do not cut their ends off, but twist them firmly and neatly together, and lay them on the side of the wound. Mark the ligature of the main artery with a knot.

Undo the tornequet and compress, and place a warm sponge on the face of the stump, and wait.

In commenting on this mode of operating, I observe that authors tell you to cut down to the muscles. This I must presume to be an inadvertence, unless they mean that you are to cut the fascia twice. This leads me to notice a passage in Mr Guthrie's excellent work on Gunshot Wounds, which I do not comprehend. He says: "But in the adop-

tion of it (simple retraction without dissection of the skin), they do not seem to be aware that the fascia and integuments should be divided by the same incision, when the whole will retract much further than the skin and cellular membrane could do, if the fascia remained to be divided by the second incision."

The operator generally partially cuts through the fascia, but not by intention. The fascia does not retract but in the least degree, and its connection at the sides of the thigh would be required to be cut deep before we could attempt to cause retraction of it. Therefore there is here some misapprehension, probably on my part.

Writers express themselves with horror of turning back the skin! as if it were necessary to dissect between the skin and fascia to do this. This may be required in the circular incision, when inflammation has preceded and thickened the integument; not only in the case of wounds, when you wait for the period of suppuration, but also in cases where inflammation, and perhaps abscess, has come upon a diseased joint. But it does not require a fibre more to be divided to turn back the skin; only a slit upon the edge of the integument.

However, if you take my recommendation to form the two semicircular cuts, instead of the direct circular incision, you will experience no difficulty.

Of Amputation with Two Flaps, and a Comparison of the Modes of Operating.

The operation of amputation with a flap* must always prove an important consideration. In the case of wounds, the surgeon must often carve out the integument on one side so as to cover the face of the stump. Sometimes a clever operator will provide a bit of skin here, and another there, anticipating the

* The operation of Le Dran with two flaps must, I imagine, have been a good operation eventually.

mode in which they will fall together, in order to the fulfilment of the great rule—that muscle shall cover bone, and integument muscle.

In desperate wounds, as those in which the limb is torn by machinery, when the poor patient has been still suffering from the violence—pale, exhausted, and trembling like a wounded bird—I have taken the torn flap of skin and muscle as part of the amputation already executed; and I have, by laying my knife into the wound, and under the flap, completed the amputation by forming a flap to correspond with that made by the injury. Nor have I found reason to repent this mode of operating; although the rule be, *that you go above the part injured, and make a clean amputation.*

I have operated in this way principally to avoid the severe shock of amputation, in a condition of the nervous system already severely shaken by the accident.

Mons. Vermale's Method, according to Le Dran.

Gentlemen must not speak of the prejudices in favour of the circular amputation, or we shall be obliged to say they have never seen it performed as it should be. When an operation is very easy, it is sure to fall into incompetent hands. The question as to the right method is a very serious one, and should be so examined.

There are two inventions which have been most improperly praised. The first is the *oblique* division of the muscles by Mr Alanson, which is nothing less than a mode of cutting away muscle, which is of the

utmost value to the formation of a good stump, and which is against the valuable aphorism of Petit—*to cut as little of the muscle off, and as much of the bone as possible.* The other improvement is, to divide the muscle at two cuts, the proposal of M. Louis; to cut first through the loose muscles, and then those which are firm. I have seen enough of this; it is a manner of digging out the muscle from the centre of the stump, and offering a most irregular and ragged surface from which to pick out the mouths of the arteries.

In amputating the thigh with two flaps, a long sword-like knife is employed. The surgeon with his left hand grasps the mass of integument on the inside of the thigh-bone. He makes a stab perpendicularly close to the bone, and carries the knife a little downwards, that is, towards the knee: he inclines the edge towards the surface; and finishes by cutting through muscle and integument obliquely to the surface. Grasping the mass of muscle on the other side, it yields; so that, entering the knife as before, and at the same point, he is enabled to perforate the mass on this side; and the knife being made to cut its way out obliquely downwards, the operation is in a manner finished, and with a dash and eclat very seducing. The soft parts are retracted, and the bones sawn through in the common way.

This is the operation practised by Desault. It has appeared to me to be attended with less pain than the circular amputation.

Let us consider the different conditions of the face of the stump. The muscles being cut obliquely, and in some measure drawn out by the knife, the integu-

ment (which has a thin edge) is too short to cover them. You will see this exemplified in the flap operation below the knee, where the parts being cut from within, the gastrocnemius hangs out beyond the skin.

The muscles being cut irregularly and obliquely, the arteries are not easily found, and their mouths are of the shape of a pen; whereas, in the other mode of operating, their mouths present directly, and are easily found in the flat muscular substance.

But all objections are of no consideration compared with the state of the nerves. They give less resistance, are drawn out before the edge of the knife, and hang from the face of the stump. I have seen it necessary to cut off a full inch and a-half of the popliteal nerve from the face of the stump.

I have been brought to reflect on this subject, because I have never seen so many cases of affection of nerves in the stump as in the last years of my attendance on the Middlesex Hospital, which I attributed to the mode of operating with the flap. I had long made it a particular injunction on my pupils, that when they amputated in the common way, they should, on retracting the integuments, be careful to cut short the cutaneous nerves which run upon the exterior of the fascia, and not to leave them with the integuments; and this I did under the conviction from experience, that those sensible cutaneous nerves being engaged in the cicatrix, gave rise to great distress. You will perceive that, in the flap operation, these cutaneous nerves are left long, projecting to the very edge of the integuments.

You will find a very meritorious paper on the stump af-

ter amputation in vol. xvi. Med. Chir. Trans., by Mr Langstaff.

He states that the nerves of the stumps have invariably an enlarged extremity, like a ganglion. But these bulbous extremities are not the result of the enlargement of the proper texture of the nerve, but a deposition of lymph in the cellular membrane covering the neurilema.

It is important to observe what he says on the adhesion of these nerves. "They are generally adhering to the surface of the stump, and frequently in union with the spicula of bone."

Mr Langstaff informs us, that, in a patient who suffered pains in the stump, extending to the hip, for thirty years, he found the extremities of the sciatic nerves united together, and to a portion of the projecting bone.

In whatever way you amputate, these dissections, as well as the sufferings we witness in patients, evince the necessity of burying the nerves deep in the stump. I have often referred to this subject at clinical lecture; for unless the surgeon attend to this matter (and they do seem to think very little about it), the patient who has suffered amputation becomes an invalid,—a sort of barometer, exhibiting the change of weather. The skin is tender—pulls upon the extremity of the bone—presses the exquisitely sensible nerve against it. Hence pain and twitches, and nervous starting of the limb; and thus the foundation is laid of permanent bad health. After these observations, you will perceive how I consider the question to hinge as to the mode of operating. A clever operator will make a good stump either way.

Of Dressing the Stump.

"The dressing," said an excellent surgeon, "is of far more consequence than the mode of operating."

We left the surgeon holding a soft warm sponge to the face of the stump.

Operate in public as you would in private; let no ignorant impatience hurry you into slovenly ways.

You grasp the stump, hold it down, and draw forward the integuments. The assistant unpins the roller, which is fixed to the patient's loins, and begins above and rolls down to your fingers, and then pins it. You now bring the edges of the integuments neatly together, and your assistant having heated a strap, lays it across; first laying it down on one side, and then adjusting it to the edge, he lays it down on the other side. You keep supporting the integuments with a dry cloth, until the other straps are laid down. Now put slips of dressing over the face of the stump; then a compress of tow; and over this the cross straps.

These cross straps being laid along the stump, they are retained by a few turns of the rollers; and they are drawn tight or relaxed as occasion requires.

In the evening, if the patient complains of the stump being tight, you loosen these straps without disturbing the dressing.

The intention of this careful rolling of the stump is to compress the veins and cellular membrane, so that the adhesive inflammation in the mouth of the vein may prevent the inflammatory action on the face of the stump from being communicated to the great vessels. The great vein being properly compressed, adheres; and otherwise it lies loose and open, and the inflammation of the general surface will be communicated to it.

On the fifth day you look to the stump. There is no smell—no purulency; it is full, plump, and adhering; therefore readjust the bandage, and do not disturb the stump.

Two days after you dress the stump. Prepare for this by ordering a fomentation cloth or cataplasm

to be laid over the stump to soften the dressings. When you take away the adhesive-straps, take one at a time, and replace it (for the adhesion must be very weak) by another, so that the integuments may not burst up or fall loose. These straps of adhesive-plaster should be snipt in the centre, opposite the line of union, or there should be a space left between them. The matter, if any, must not be confined.

Certain ligatures on trifling vessels you now twist away, carefully preserving that which is on the main artery. You dress as before, taking care that, as there must be partial suppuration, you leave a drain by which matter may escape. The ninth is a critical day with a stump; it is apt to burst up, after promising a complete union by the first intention. Still proceed as before, and keep the parts supported.

The ligatures so much talked of, being removed from the smaller vessels, the longer ligature being brought out below, so far from being a source of irritation, conveys the matter from the face of the stump; and if you do not so manage as to make this use of the ligature, place a piece of dressing at the lower edge of the line where the skin meets, so as to keep that part open and give vent to discharge.

I have in other parts of this work (p. 107) described the bad effects of deep suppuration with confined integuments. The case of the stump after amputation is not so far removed from a compound fracture but that the parallel may hold. The integuments may unite, and the muscle be in a state of bad suppuration (an effect for the most part of careless dressing). The discharge must be made perfectly free, disregarding altogether the new adhesions.

It is this very occurrence which, not provided against, has caused such surgeons as the most estimable Baron Larrey to dress the face of their stumps, keeping the integuments open until they are in a state of suppuration, rejecting the English manner of proceeding altogether.

As to treatment after amputation, I hope I have anticipated all that is most essential. You see for the most part amputation performed for diseases which have exhausted the patient. Remember the different condition of those who have suffered the operation from accidents, or in the field. They require a stricter antiphlogistic treatment, and probably bleeding.

The fears we have are from the constitution suddenly giving way about the fifth day, in cases of amputation after violent injury to the limb; and then from fever producing a bad suppuration, and from inflammation of the veins.

Hæmorrhage from the Stump.

Hæmorrhage from ruptured adhesion you will readily distinguish. Hæmorrhage from veins you will manage by the roller. But if hæmorrhage proceeds from the femoral artery on the face of the stump, do not expect to tie it if the surface be foul and sloughy, but make an assistant compress it, and lose no time in cutting down upon the fore part of the thigh and securing the artery there. It may have been accident, but I have always seen the sloughy face of the stump rapidly improve after this has been done.

Amputation of the Stump.

You will find a paper on Amputation in the second volume of the Memoirs of the Royal Academy of Surgery of Paris. You there find them discussing the mode in which to avoid the conical or sugar-loaf stump, and the projection of the bone. Considering how English surgeons have vaunted their manner of operating, you would suppose the thing could not happen in this country; yet it has presented so often of late years that I had to invent an instrument by which the integuments are to be pushed back and the bone sawn again! The academicians you will find discussing the question, whether the projecting bone should be left to exfoliate or be sawn off.

M. Maunoir of Geneva published a Memoir in favour of the English mode of operating in amputation. In that essay he contrasts the method of which he is the advocate, with that practised by Dupuytren, who having divided the integuments and muscles together,* took the farther means of insuring a bad result by raising up the stump to the perpendicular; and this he did for a reason somewhat too ingenious,—that the blood might be impeded by the sudden angle of the artery at the groin, and the ligature protected.

I have explained the mode of turning up the stump and disclosing the bone, before sawing the bone. If this be done, and the stump afterwards gently held down by a piece of bandage over it, and pinned to the mattress, you will never see the bone again: it is deep among the muscles, removed from

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* After the battle of Waterloo, certain Frenchmen were brought to me who had suffered amputation. The stumps were so novel a sight to me that I made a drawing of one. There came off a round cake of sharpie, which corresponded with the face of the stump. The stump itself was one uniform flat surface, integument, muscle, and bone forming one plane, as you may see in a ham shop.

the nerves, *so that they shall not be folded on its edge*, and also in the condition the least likely to give you trouble by exfoliation. But if the old rule be taken, "that the assistant entrusted with the lower part of the limb should, as soon as the flesh is divided, hold the bone firmly down upon the end of the board or table," then most certainly, on the stump rising, the bone must project, and then there will be abundant scope for the grand question, "Whether is the denuded bone which projects from the integuments of the stump to be permitted to exfoliate, or is it to be sawn off?" as was debated in the French Academy.

As to the conical stump, the manner to produce it is exactly that recommended by Alanson,—that after dividing the integuments, you should fix the point of the knife on the bone, and moving it round in an oblique direction, scoop out the muscle. Or the manner of M. Louis, which is to do the same thing by an easier and clumsier method. The effect is, however, sometimes produced by the suppuration and wasting of the flesh, and contraction of the skin over the bone, when the surgeon cannot be blamed.

There has in all this been an entire mistake. On the face of a stump the mass of muscle degenerates, but there is left an insensible tough mass covering the bone, and between it and the integuments, or between it and the cicatrix. By this scooping away, as well as by the formation of a flap, this mass of flesh is taken from between the bone and integument.

The deficiency of the muscular mass tends to the formation of a conical stump.

My friend Mr Guthrie, in order to avoid exfoliation, recommends scooping out the muscles to the end, that the bone may appear deep in "the bottom of a cone as a de-

pressed point." Let him take the advice of an old friend, just to try the mode I have advised, and he will see the "depressed point of bone" disappear altogether.

A stump should be round, full, and fleshy. The best compliment I ever received was on the disclosing one of my amputations, and the idle dresser painting two eyes and a nose on the face of the stump, it appeared like a chubby cheeked boy, with a pursed mouth restraining a laugh.

But the stump does not remain always round, the flesh wastes very considerably; and here let me remind you that you have a severe critic on your operation; the cork-leg maker is provoked when you leave too much skin, which becomes loose and flabby.

But if the skin and bone come into contact and adhere, without the intervention of a mass of muscle (no matter that the mass has degenerated), the bone projects and ulcerates from time to time, and becomes a source of great distress.

It is a thousand times worse when the nerves are engaged in the cicatrix and drawn over the face of the bone, and the only relief is

*Secondary Amputation.**

You make the skin be drawn back, and with a sweep of the amputating knife, go round and round, with instant relief to the nervous pains. Putting on the retracting cloth, you expose the bone as far as possible, and saw it through.

There is one circumstance more to be noted. The

* "Secondary amputation" is used to denote an operation performed at the second period or time of suppuration.

flexor muscles retract more than the anterior mass, so as to give an inequality to the old face of a stump. In order to bring the cicatrix behind the point of bone, it has been proposed to make a flap on the fore part of the thigh to fall over the bone. If this be your mode of proceeding, take care that there is something more than integument in the flap.

I was wont to manage this by a slight inclination of the knife, so as to leave the ham-string muscles a little longer.

High Amputation and at the Hip-Joint.

Read Mr Orton's paper, *Med. Chir. Trans.* vol. xiii. He successfully amputated at the hip-joint. There does not appear to have been disease in the joint, and the question recurs, was it necessary to take the head of the femur from the acetabulum ?

In amputation high in the thigh I have proceeded in this manner. The assistant was instructed first to compress the artery at the groin. Afterwards, as soon as I had made my incisions, to grasp the flaps largely with his hands. My first incision began by an oblique cut with the scalpel, which laid bare the femoral artery and profunda; I cut them across, and drew them out with the tenaculum (in the mean time the blood was flowing backwards from the mouth of the femoral artery below). I then set on the great amputating knife in the cut already made, and continued it in an oblique direction to the bone (taking care to keep the integuments of length to project a little from the muscle). The instant this was done, the mass was grasped by the assistant. I then made, with the same knife, another and a larger flap on the outside. I then took

up the bleeding vessels from among the muscles of the flaps; and, lastly, sawed across the bone. The soft parts came well together.

It is possible to amputate high up with the assistance of the tourniquet; if you use it only while you secure the principal vessels, and throw it off before raising the limb and sawing the bone.

An opinion is universally expressed by such old authors as Heister, Le Dran, &c., &c., that high amputation of the thigh is dangerous; the constitution suffering a shock in proportion to the mass taken away, and in proportion to the extent of divided surface. That this danger must be increased by taking off the thigh at the hip-joint, there can be little doubt.

Mr Guthrie says he considers "the prejudice (against amputating at the hip-joint) common to both British and French military surgeons." But why call this a "prejudice?" It is an opinion formed on great experience, and almost universal. We must then weigh the prejudice against the vanity of having to say, "I have done it,"—a vanity that never prevailed so extensively, and to such a degree, as of late years. I never saw this desire of distinction so evinced as on one occasion, on going round my museum with an Italian surgeon of distinction. We were looking on a diseased thigh-bone, when, "mounting his eyes," and putting his hands together, he said, "I let the most glorious opportunity escape me of distinguishing myself." This zeal may be all very natural, but it is not of the highest order in the walk of ambition. The safe

surgeon is one whose reputation is above this, and based on better grounds.

The main question is one which we cannot discuss here—In what case is it necessary to disarticulate the head of the bone, and amputate the thigh? I have some hesitation in giving my assent to the propriety of the operation in the cases in which it has been done.

Baron Larrey cuts down upon the crural artery and vein, and includes them together in a ligature close to the crural arch. He then plunges his long knife, cutting on both edges, between the muscles attached to the lesser trochanter and the neck of the bone, and makes a flap on the inside. This exposes the articulation. It is easy, he says, to cut into the joint—easy to divide the round ligament; when the assistant, extending the limb outwardly, he passes his knife between the brim of the acetabulum and the great trochanter, and cutting downwards and outwards, forms his second flap.

Mr Guthrie, the best entitled to have an opinion on this subject, makes some objections to this mode. He, after the inguinal artery is secured by compression, makes two semicircular incisions, commencing four fingers' breadth below the anterior superior spinous process of the ilium, the inner incision forming the larger flap. The integuments being retracted, the gluteus maximus and gluteus minimus are cut from their insertions, to compose the flesh of the outer flap; then the muscles of the inside of the thigh are divided, the artery and veins are at the same time cut across. These vessels are seized by the fingers and thumb, and the tenaculum thrust through

them, and the ligature put round them. The surgeon then cuts through the small muscles which run to the trochanters, and opens into the capsule, and disarticulates the bone. Mr Guthrie recommends expedition. To say the truth, it is a rude operation, however it may be performed; and certainly, without much to applaud, if that be the object, it may be done in a few seconds. Since giving this advice, Mr Guthrie has taken off the limb at the hip-joint, and with complete success. He was ever noted for the precision with which he made the parts fall together in the stump.

Mr Guthrie thus proves the practicability of the operation consistently with the preservation of life. An author has added to his commendation, that he hopes to see it performed as readily as the amputation at the shoulder-joint. God forbid. The difference is immeasurable.

Amputation below the Knee.

Place the tournequet a little above the middle of the thigh; the compress, where you feel the artery, passing under the sartoreus. When you put the tournequet upon the popliteal artery, you require to screw it with great force.

Assistants as before;—the retractor a cloth of three tags;—a scalpel by you.

Take your position on the inside of the limb. Mark the insertion of the ligament of the patella into the tibia. Measure off a full hand's breadth downwards, and then begin your first incision.

Stretch your hand round under the limb. Setting

on the amputating knife on the spine of the tibia, incline it a little downwards before you make the full sweep of the circle. When you bring the knife round till within two inches of meeting the incision, incline it upward, to fall in on the point where you commenced. Touch the cellular connection all round as the assistant retracts the skin. You do not require to dissect under the integument, in order to fold up the integument; but, instead of this, the assistant may put round the edge of a towel, to draw back and to guard the posterior part of the integument.

Setting on the knife close to the retracted skin, you cut round to the bones. But with one sweep you cannot divide the whole; the muscles are guarded by the projecting spines of the bones. With the point of the knife you cut between the bone, first on the fore part, then on the back part, and at the same time you pierce and divide the interosseous ligament.

Your assistant in the short pause having, with the handle of the tenaculum, put through the centre rag of the retracting cloth from below, and having lapped the three stripes together, and gathered the whole in his hands so as to draw up the muscles, you perceive that he does you very little good. This is on account of the interosseous ligament. You therefore take the scalpel, and cut the ligament close to the bone; and as you cut, the retractor pulls up the soft part from the bones. In thus relieving the interosseous ligament, take care that you do not divide the arteries, high up, and perhaps a second time. I have seen an unskilful operator cut the artery close to the division, attended, of course, with a full jet of blood, after the three arteries had been regularly tried. When the amputation is performed, so that the bones are divided near their union, it gives you much trouble to pick out the posterior tibial artery. But you must draw it out and tie it correct-

ly, and if the blood continues to flow, see that it is not from some branch cut short just above your ligature.

But to proceed. Having retracted the soft parts, you place the saw resting on the tibia, and so inclined that you cut through both bones.

Do not take off the head of the fibula; but this you may do—saw off the projecting angle formed by the spine of the tibia, since it projects sharp under the integument, and is apt to cause ulceration of the skin.

The three arteries being found and tied, you loosen the *tournequet*, and find also the *surales*, muscular arteries in the substance of the gastrocnemius and soleus.

The integuments are brought together from the sides.

When the flap operation is performed high on the leg, by using the long knife to penetrate behind the bones, and to form the flap, by cutting downwards and backwards the integuments are cut too short and the gastrocnemius too long. It hangs out with its fascia beyond the skin. When the flap is brought up, the skin is all too short, and requiring the ligature or firm strapping; it is irritated, and the stump goes wrong.

Amputation with the Flap nearer to the Ankle.

No patient will thank you for leaving the leg long, unless his circumstances and duties enable him to have such an apparatus in the form of a wooden or leather foot, that he retains the use of the knee-joint.

If you amputate low in the leg, you should do it with a flap. The way I prefer doing it is this. With the large amputating knife, I form an oblique

semicircular sweep through the skin. Drawing the skin upwards with my own hand, I set down the edge close to the skin, and cut obliquely upwards and to the bones. Having the knife so, look to the flap, and judge if it will correspond with what remains of the diameter of the leg to be divided. If it does not, move the edge of the knife upwards and close to the bones: having thus formed the flap without withdrawing the knife, sweep it round the fore part of the leg, dividing the integuments by a direct semicircular incision. Divide the remaining muscles which have been guarded by the bones, and pierce the interosseous membrane.

If rapidity of motion be desirable, this mode of operating should satisfy you; since if cleverly done, it is finished without taking the knife from the wound, and nerves and bloodvessels are smoothly divided.

Saw the bones, take up the three arteries, roll down the calf of the leg, and bring the flap up with the adhesion straps.

I confess most surgeons prefer doing this operation by using the catlin, stabbing with it through close to the bones, and making the flap by cutting downwards and towards the surface; infallibly the tendon will dangle out!

Amputation of the fore part of the Foot.

I shall borrow the description from my colleague Mr Syme, who performs this operation very adroitly.

"The blade of the knife employed should be about six inches long, and half an inch broad, sharp at the point, and blunt at the back. The tournequet ought

to be applied immediately above the ankle, having its compress placed over the posterior tibial artery. The surgeon should measure with his eye the middle distance between the *malleolus externus* and the head of the metatarsal bone of the little toe, which is the situation of the articulation between the *os cuboides* and *os calcis*. Placing his fore-finger here, he ought to fix his thumb on the other side of the foot directly opposite, which will shew him where the *os naviculare* and *astragalus* are connected. An incision somewhat curved with its convexity forwards is then to be made from one of these points to the other, when, instead of proceeding to disarticulate, the operator should transfix the sole of the foot from side to side at the extremities of the first incision, and carry the knife forwards, so as to detach a sufficient flap, which must extend the whole length of the metatarsus to the balls of the toes. The disarticulation may finally be completed with great ease, as the shape of the articular surfaces concerned is very simple, and nearly transverse.

"The external plantar, anterior tibial, and any other arteries that require to be secured, must then be tied, and the flap having been secured in its place by a few stitches, some slight dressing ought to be applied. During the cure the knee ought to be kept bent to relax the *gastrocnemius*."

Amputation of the Shoulder Joint—Excision of the Head of the Humerus.

Mr Knight, Inspector-General, desirous that the medical gentlemen sent out to join the army in the

Peninsula, should be fit for all their duties, gave each into the charge of Mr Lynn of the Westminster Hospital, to perform with him a course of operations on the dead body. The body was soon cut to pieces, and the course finished with the operation of amputation at the shoulder joint, a favourite operation of my friend Lynn, and which he had successfully performed. I cannot help conjecturing that this course of study produced a familiarity with this resource of amputation at the shoulder, whilst there was a remarkable negligence in the consideration of the cases to which the remedy was applicable.

It may be an argument against this hypothesis, that the first time I saw the operation performed was by a naval surgeon, the late Mr Vance, a good anatomist, and a man of singular energy. But when I reflected on the case for which this operation was performed, I made my mind up to oppose such a plea for an operation difficult in the performance and very severe on the sufferer. The humerus of that patient is in the College of Surgeons of Edinburgh. A musket ball struck the head of the bone, and shattered it so, that when I put my hand upon the shoulder, it felt like a bag of sand.

When I dissected this bone, I found only the head of it shattered, and I considered the subject in this manner. These surgeons do nothing when a musket ball passes across the deltoid. It is the state of the bone, then, that determines them to amputate. Suppose, instead of amputating, they cut through the deltoid, and took away the shattered bone, would it not be better—would not the man's

life bemore secure, the pain less,—and might not he retain something of a useful limb?

The next case I saw proved to me that although the operation was easily done by a man accustomed to operations, it was not without danger in other hands; and that if it were to be considered an operation fit to be performed by every surgeon capable of performing the common amputation, that much loss of life must result.

I considered it then, and continue to look upon it, as very proper to diminish as much as possible the list of cases in which amputation at the shoulder-joint is to be performed. On returning from Portsmouth in January 1809, to my duties, I explained, at lecture, my views of this subject; and on the breaking out of the American War, the cast of the shoulder, now in the College of Surgeons of Edinburgh, was brought to me, with a liberal acknowledgment of the surgeon that he had acted on my suggestion. You will there see that the head of the humerus being shattered by a ball, instead of taking off the arm, he had taken away the head of the bone. Anchylosis of the humerus and scapula was the consequence, and from the free motions of the scapula, a useful arm was retained.

(Now consult Baron Larrey, and the array of cases in Mr Guthrie's work.)

After Waterloo, the operation was performed in the York Military Hospital, Westminster, but not in a manner deserving imitation. They made too much of an operation of it, by making a flap of the deltoid. I conceive the simpler and better operation is to divide the deltoid, in all its length, from

the acromion to the insertion of the muscle—to turn out the broken end of the humerus, and *smooth* it by the saw or bone nippers, and to pick away the broken portions of the head.

The amputation at the shoulder-joint is necessary in other instances, and the operation must be varied according to the occasion. In general, it will happen that the deltoid is so destroyed, that the flap cannot be made by turning it up, else undoubtedly it ought to be done. But in other cases, you must make either two flaps on the side, or one larger lateral flap, according to the state of the integuments.

In preparing for the operation, you place the patient on a strong chair; put a sheet round him, and under the shattered arm; give this to a person to hold, and make him stand well off and out of the way; his business is to hold the patient up against the pressure which is to be made on the subclavian artery.

The assistant stands over him, pressing upon the artery in the hollow above the clavicle; the younger assistant sits low, holding down the arm. For if the patient raises the shoulder on the touch of the knife (which he is sure to do), the assistant's thumb is taken off the artery.

When operating, I have grasped the mass of the shoulder, integument, and deltoid, and with a sweep of the great knife raised the whole in a flap; an assistant raises and grasps the mass to save blood. The arm being held down to the side, with the same knife, or with a scalpel, I cut through the tendons of the infra and supra spinatus into the capsule, and relieve the humerus from the scapula so far, that you

may slip the thumb into the joint; then with the fingers in the axilla, and on the outside of the integuments and the thumb within, you hold the whole mass of artery, vein, and nerves; you divide them by one motion of the knife, placed close to the bone, and cutting towards the side; which done, you continue your hold until the tenaculum being handed to you, you pick out the open mouth of the artery without losing a drop of blood!

Now, the whole surface being exposed, you are careful to take up the scapular or circumflex arteries, or muscular branches. Then look to the mass of nerves, and take care that they are cut short and buried deep. The flap is brought down, or the flaps brought together; and the surface, not to say the stump, has a better appearance than in any other amputation. Adhesive straps and the spica bandage are to be used.

Mr Guthrie, considering only what is easy for him, an experienced, cool, and dexterous surgeon, to do, considers my precautionary mode of securing the artery as quite unnecessary. The artery is to be divided, trusting to the compression above the clavicle. Now, I consider it my duty to say, that, with the generality of surgeons, the patient through this overconfidence will be lost. I have seen the artery give out its blood in full jet, and it is a most alarming whish with which it is delivered. You are told, on this occurrence, to clap your doubled fist on the face of the stump. But to put a ligature on the artery, you must raise your fist, and hook up the artery whilst the blood is gushing. In short, the army surgeon must take the advice of a surgeon without an

epaulette for once, or incur great responsibility; and remember that a man who suffers from bleeding does seldom die under operation,—there is a shock from great hæmorrhage from which there is no recovery; he sinks enfeebled.

Amputation of the Arm.

The amputation of the arm below the deltoid is very simple. Do the patient justice; do it *regularly*, and see that the nerves are well covered. Assalini shewed me how he did it in the field. He had a long instrument like a pork butcher's, which was a knife on one edge and a saw on the other. Now, says he, I take the arm so, grasping it, and pressing the point of the mid-finger on the brachial artery. I make a circular incision of the integument; I retract the skin—make a second circular cut through the muscles—turn my knife—saw through the bone—lay down the instrument—seize the artery with my fingers and thumb—the assistant ties it.* I leave it, mount my ambulance, &c.

This being the very extreme of activity and dispatch, I hope our British surgeons will, in future wars, resign the contest, and rest their reputation, which they can very well afford, on something better than on rapidity of motion and the long knife.

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* I believe I have stated, that amputations performed after accidents, are attended with less activity of arteries than when the operation is performed for some exhausting complaint, as white swelling. This makes the practice here stated practicable, though not proper; the main artery secured, the patient will not bleed to death after the removal of the limb.

When the amputation of the arm is made above the insertion of the deltoides, there are circumstances remarked by Baron Larrey; the deltoid being the antagonist of the pectoralis and latissimus dorsi, the end of the bone is drawn in upon the nerves in the axilla. The remedy is a very obvious one: divide the bone above the insertion of these muscles, which at least saves the necessity of opening the joint, and performing what in these circumstances the Baron recommends—the amputation at the shoulder-joint. We cannot comprehend his further reasons for preferring the amputation at the shoulder, viz. the difficulty of taking up the artery, and the irritation to the bundle of nerves from the ligature. We do not perceive the reason why the artery should be more difficult to tie, or why the ligature should be a greater source of irritation when the head of the bone remains in its place, than when the amputation is performed at the joint. However, there is so much in experience, that I would recommend attention to the remarks of the Baron. Mr Guthrie is in favour of dividing the humerus below the tubercles.

Amputation at the Wrist.

A country surgeon, in his rides, meeting with a case in which the hand and fingers are crushed, may amputate, having only his pocket case, as the surgeon-general of Ireland does it, by making a flap, and then cutting into the capsule, and turning out the ball of the carpus from the navicular cavity of the head of the radius. But surgeons have, in general, acted on the old advice, " that the parts about

a joint digest ill;" and prefer amputating where they can cover the bone with muscle.

Amputation in the Fore-arm.

The fore-arm should be amputated in such a manner as to save a good portion of the flexor and extensor muscles. Mr Syme recommends the wrist to be bent when the flexor muscles are divided; to be extended when the extensors are divided—of course, intending two flaps.

Amputation of the Toes and Fingers.

Mark well the centre of motion, or at least the centre of the joint; make a transverse cut, half a diameter anterior to the centre of the joint; divide the lateral ligament on one side, and turn off the bone; divide the remaining lateral ligament. Now place the scalpel flat under the bone, and moving the knife towards the extremity of the finger, cut out a flap of the firm and fatty integument on the palmar surface of the finger, of such extent as will, being folded up, cover the face of the cartilage.

In amputating at the metacarpal bone, do not cut into the palm, but on the dorsum only; by using the bone-nippers, you divide the bone and dissect it out, taking care to keep close to the bone.

Do the same in taking off a toe at the metatarsal bone. Do not interfere with the mass of nerves and muscles in the sole or in the palm.

END OF VOL. I.

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